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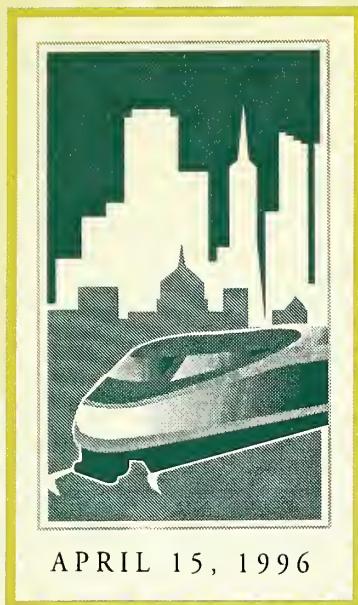
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APRIL 15, 1996

CALTRAIN SAN FRANCISCO  
DOWNTOWN EXTENSION PROJECT  
CONCEPTUAL DESIGN AND DRAFT EIS/EIR

# Alternatives Considered Working Paper

PENINSULA CORRIDOR JOINT POWERS BOARD

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ALTERNATIVES CONSIDERED WORKING PAPER



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## CHAPTER 2.0

### DETAILED DESCRIPTION OF ALTERNATIVES

#### **2.1 INTRODUCTION**

This chapter describes the two alternatives identified by the Joint Powers Board (JPB) to be carried forward in the Draft Environmental Impact Statement (DEIS)/Draft Environmental Impact Report (DEIR) for the CalTrain San Francisco Downtown Extension (DTX) Project. The two alternatives are the No Build Alternative and the Transbay Terminal Site Alternative.

The No Build Alternative represents the existing and committed (funded) transportation services and facilities in the Project Area (**refer to Figure \_\_\_\_\_, Project Area**). The No Build Alternative includes existing CalTrain service and funded improvements; related bus, rail and roadway improvements in the Project Area; and a BART extension to San Francisco International Airport.

The Transbay Terminal Site Alternative represents the "build" scenario for extending CalTrain from its current terminus at Fourth and Townsend Streets to downtown San Francisco. The build alternative incorporates all the elements described in the No Build Alternative except for those transportation services or facilities that would be replaced or discontinued as a result of construction and implementation of the Transbay Terminal Site Alternative. In addition, this alternative includes the underground rail extension and new terminal facility at the site of the existing Transbay Terminal in downtown San Francisco, the propulsion system for operating CalTrain in subway and along the length of the alignment, expanded park-and-ride lots at 18 station locations, and a new CalTrain storage yard. An underground CalTrain terminal would require demolition of the existing Transbay Terminal. Replacement of this bus facility would be a project mitigation. The existing terminal and track at Fourth and Townsend would be removed.

A description of the alternatives, including the respective capital and operating/maintenance costs, and the process of selecting the alternatives for the DEIS/DEIR are presented below.

#### **2.2 SCREENING AND SELECTION PROCESS**

##### **2.2.1 Previous Studies**

Several studies have evaluated options for locating a CalTrain station in downtown San Francisco. Among the earlier studies was the 1975 *Peninsula Transit Alternatives Project (PENTAP)*, which recommended several actions including public acquisition of the Southern Pacific (SP) right-of-way and relocation of the Fourth and Townsend station to the downtown core.



In 1984, Caltrans conducted the *San Francisco Terminal Relocation Study*, which recommended a below grade alignment from I-280 and Sixth Street to the Transbay Terminal area. This study predicted that the extension would attract some 30,000 passenger boardings at a new Transbay Terminal station alone.

In 1987, the JPB sponsored the *Interim Upgrade Study*, which recommended a two-track subway extension to an underground station near the Transbay Terminal. This study classified the extension as "the single most important improvement that can be made to the Peninsula commuter line at the present time."

The JPB requested and received authorization in 1989 from the Urban Mass Transportation Administration (UMTA), now the Federal Transit Administration (FTA), to prepare an Alternatives Analysis and Draft Environmental Impact Statement (AA/DEIS) for the project. A series of public meetings and JPB agenda items provided the public with the opportunity to discuss alternatives and identify environmental issues and possible mitigation measures to be addressed in the AA/DEIS. Comments from public meetings along with an initial screening of alternatives led to the three alternatives that were identified for inclusion in the AA/DEIS. A draft AA/DEIS was developed in 1991, but FTA did not approve public circulation of the draft due to a lack of funding commitments for the local share of the project cost.

The project was revived in late 1993 when the JPB joined with the Metropolitan Transportation Commission (MTC) to identify ways to reduce costs and again review federal, state, and local funds to finance a less costly alternative(s). This study evaluated nine project alternatives. Following public review, the JPB passed a resolution (No. 1994-8) that identified Alternative 8B (electrified service extended to a terminal at Market and Beale Streets) as the Locally Preferred Alternative (LPA). The resolution also designated Alternative 3B (electrified service extended to the Transbay Terminal) as an additional alternative to be carried forward for conceptual engineering and environmental analysis in the next phase, the CalTrain DTX Project.

## 2.2.2 Screening of Design Options

In March 1995, the JPB initiated the study of the two "build" alternatives identified in Resolution 1994-8. The alternatives, named the Market/Beale Alternative (the LPA) and the Transbay Terminal Site Alternative, were defined to include several design options (**Figure 2-1**). Engineering, environmental, and cost analyses of the alternatives were performed for the design options being considered. Eight principal design decisions were summarized in the Design Options Screening Report, published in September 1995. They were:

- **Decision #1: Which East/West Alignment and Short or Long Tunnel Option Should Be Selected?** Four options were considered: 1) an alignment on Townsend Street that would have a portal east of Fifth/Townsend (short tunnel option); 2) an alignment along Townsend that would have a portal south of Berry/Seventh



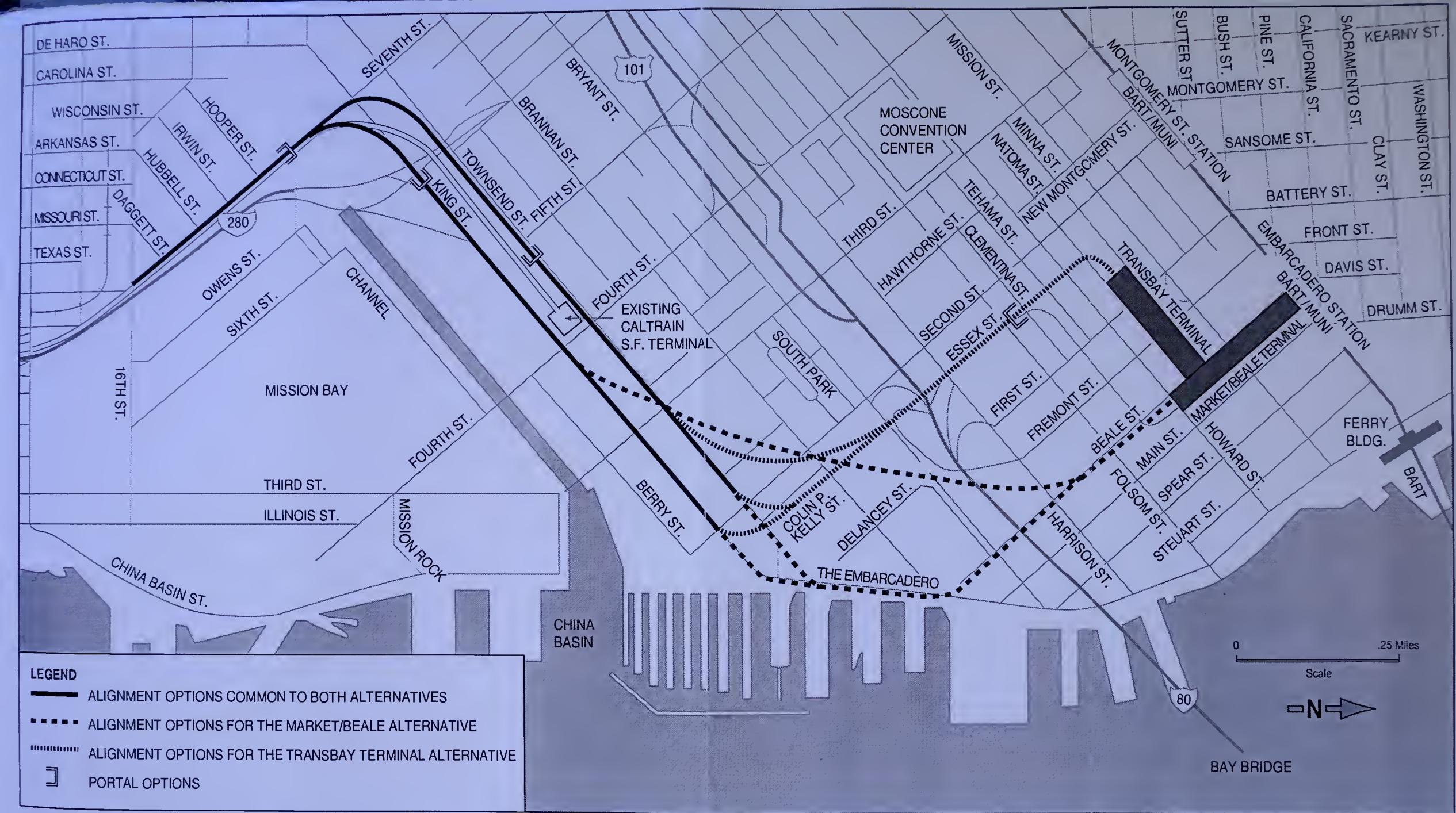


FIGURE 2-1  
MARKET/BEALE AND TRANSBAY TERMINAL SITE ALTERNATIVES:  
ALIGNMENT OPTIONS



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(long tunnel option); 3) an alignment along King Boulevard that would have a portal east of Sixth/King (short tunnel option); or 4) an alignment on King Boulevard that has a portal south of Berry/Seventh (long tunnel option);

- **Decision #2: Which North/South Alignment and Construction Technique Should Be Selected for the Market/Beale Alternative?** Two potential north/south alignments were considered for the Market/Beale Alternative: 1) cut-and-cover construction from Townsend and The Embarcadero to Market/Beale; or 2) mined tunnel construction from Third/Townsend to Market/Beale.
- **Decision #3: Which North/South Alignment and Construction Technique Should Be Selected for the Transbay Terminal Site Alternative?** Two potential north/south alignments were considered for the Transbay Terminal Site Alternative: 1) a short mined tunnel/cut-and-cover from Brannan Street/Colin P. Kelly Street to the Transbay Terminal site; or 2) a long mined tunnel from Third/Townsend to the Transbay Terminal site.
- **Decision #4: Which Market/Beale Terminal Configuration Option Should Be Selected?** Three underground terminal configurations were considered for the Market/Beale terminal: 1) three-level underground terminal with four tracks terminating at Market Street; 2) two-level underground terminal with two tracks terminating at Market Street and two tracks terminating at Mission Street; and 3) a two-level underground terminal with four tracks terminating at Mission Street.
- **Decision #5: Which Transbay Terminal Site Terminal Configuration Option Should Be Selected?** Two terminal design options were considered for the Transbay Terminal site: 1) an aerial (second level) station at the Transbay Terminal site; or 2) an underground station at the Transbay Terminal site.
- **Decision #6: Should the Market/Beale Alternative or the Transbay Terminal Site Alternative Be Selected?** CalTrain could be extended to a downtown San Francisco Terminal Station located either under Beale Street at Market Street or at the existing Transbay Terminal site (with or without a new bus terminal).
- **Decision #7: Which Locomotive Propulsion and Ventilation System Option Should Be Selected?** Four propulsion/ventilation system options were considered: 1) "clean" diesel; 2) liquefied natural gas; 3) electric; or 4) dual-mode (diesel and electric).
- **Decision #8: Where Should a New CalTrain Storage Yard Be Located?** Two potential locations for train storage were considered: 1) under and adjacent to the I-280 viaduct north of 16th Street in Mission Bay; or 2) near the former Bayshore Yard in Brisbane.



A public participation program that described the DTX Project alternatives and design options to the stakeholders and residents in the CalTrain corridor and solicited their input was initiated at the beginning of the project. An extensive door-to-door outreach program was conducted and over 40 meetings with key stakeholders occurred. In addition, several community workshops were organized in June 1995 to receive community input. In Fall 1995, two community meetings (in San Carlos on October 11, 1996, and in San Francisco on October 19, 1996) were held to receive public input regarding the eight decisions. On January 4, 1996, the JPB decided to eliminate the Market/Beale Alternative from further consideration for the following reasons:

- South Beach residents and property owners strongly objected to the disruption that would result from constructing the Market/Beale Alternative alignment through this neighborhood;
- A long mined tunnel under South Beach and Rincon Hill was costly and had significant risk of cave-in during construction;
- Cut-and-cover construction would disrupt traffic and pedestrian circulation, particularly along The Embarcadero, a newly reconstructed roadway; and
- The Market/Beale terminal site was more costly, had greater engineering constraints, including affecting building substructures, and could less easily accommodate six tracks for CalTrain and High Speed Rail than the Transbay Terminal site.

The King Boulevard alignment option also was dropped because of the potential disruption during construction to traffic and transit in the newly constructed King Boulevard/Muni Metro extension right-of-way during.

The JPB eliminated the potential train storage area at the former Bayshore Yard because of the added deadhead costs (non-revenue service time needed to move trains between the storage yard and the downtown station). Diesel and liquefied natural gas propulsion systems in the subway were rejected because of ventilation and safety concerns, respectively.

Subsequent community meetings in March 1996 were held to refine the Transbay Terminal Site Alternative, the one remaining Build Alternative to be carried forward in the DEIS/DEIR. A complete description of the Build Alternative is presented in Section 2.4.

## **2.3 ALTERNATIVE 1 - NO BUILD ALTERNATIVE**

### **2.3.1 CalTrain System Characteristics: Existing Service and Funded Improvements**

Currently, CalTrain operates 59 weekday trains serving 28 stations between San Francisco and San Jose Diridon Station. One additional train is operated on Friday



nights. Of the 59 weekday trains, 46 serve the Tamien Station, a multi-modal facility located south of San Jose Diridon station that links CalTrain with the Santa Clara County light rail system. CalTrain was extended to Gilroy in southern Santa Clara County in 1992. Four morning and evening commute trains serve this five-station extension. Of the 34 designated stations along the 78-mile long alignment from San Francisco to Gilroy, 26 have existing parking lots, paved and unpaved (**Figure 2-2**). System-wide, CalTrain currently provides 6,770 parking spaces, 5,000 of which are provided north of San Jose Tamien Station. Weekdays, the parking lots north of Tamien Station are at 80 to 100 percent of capacity.

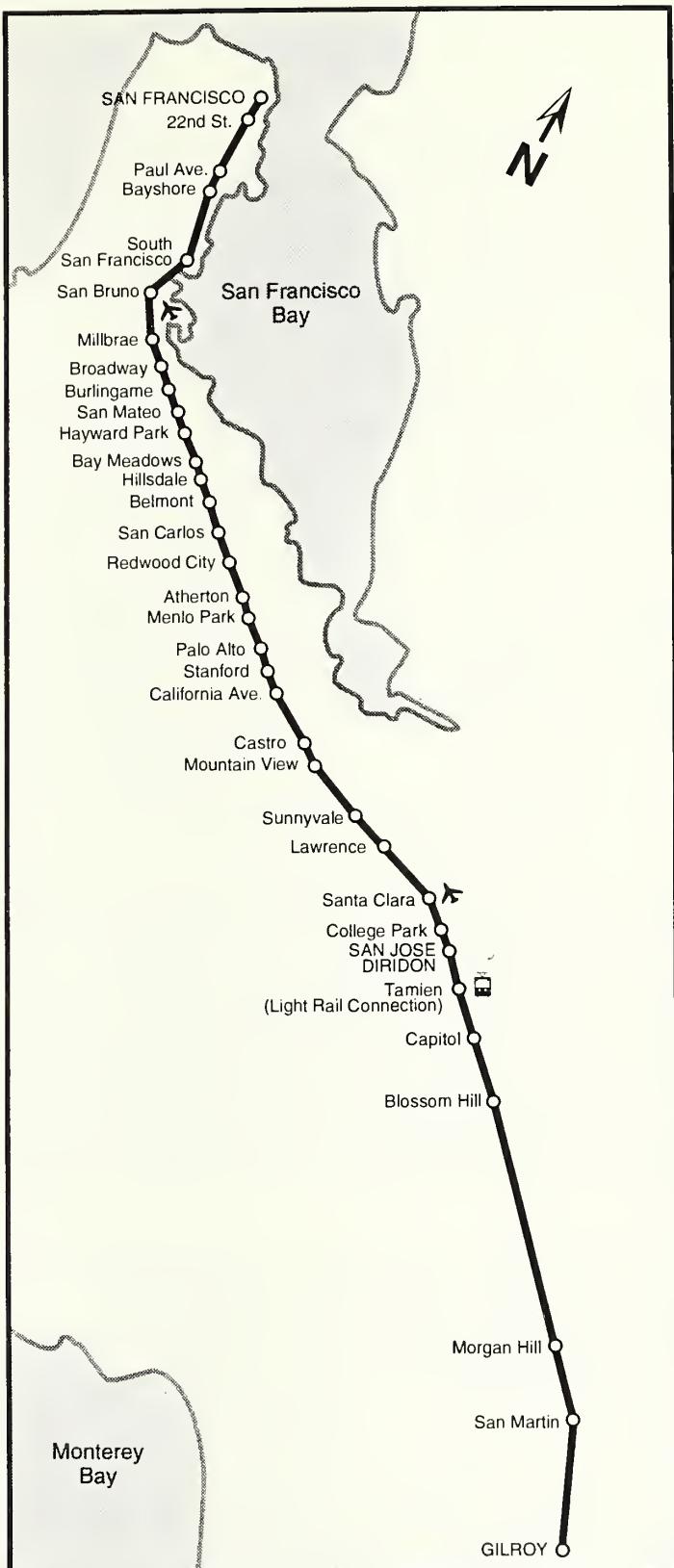
The CalTrain fleet consists of 73 bi-level gallery cars and 20 diesel locomotives. Twenty-one of the gallery cars have cab-control, which allows push-pull operation. Northbound daily service begins at 4:43 a.m. from Tamien Station. The first southbound train departs San Francisco's Fourth and Townsend Station at 5:00 a.m. CalTrain operates 26 trains on Saturday and 20 trains on Sundays and holidays, with a late train departing San Francisco at 12:01 a.m. each Saturday and Sunday. Although CalTrain service remains oriented to commuter travel, hourly trains operate weekdays in the midday and evening.

In recent years, reverse commuting to San Mateo and Santa Clara Counties has become an increasingly important component of the peak period commute. For example, between 1980 and 1990, the number of San Francisco residents who commuted to Santa Clara County doubled. CalTrain has responded to the increased reverse commute demand by instituting eight trains from San Francisco to San Jose Diridon between 5:00 a.m. and 8:00 a.m. each weekday. Conversely, eight reverse commute trains operate from San Jose Diridon to San Francisco between 3:30 p.m. and 7:00 p.m.

Over the past few years, CalTrain ridership levels have remained relatively static in spite of the added reverse commute trains, added midday trains, and the service extension to Gilroy. Approximately 7,000,000 annual trips (22,000 weekday trips) have been made on CalTrain. Of the weekday trips, 13,000 were made between Santa Clara/San Mateo Counties and downtown San Francisco. Downtown San Francisco remains the primary destination for CalTrain commuters in spite of the decline in downtown San Francisco's share of regional jobs. Ninety-five percent of passengers arriving in or departing from San Francisco use the terminal station at Fourth and Townsend Streets. The existing terminal, which was completed in 1975, includes covered ticket counter, snack bar, and passenger waiting areas. The station has 12 terminal tracks, all of which are utilized for train arrivals, departures, midday storage, and minor servicing and maintenance activities.

In concert with the implementation of the Muni Metro extension to Sixth and King Boulevard in 1996, the JPB has programmed a series of capital improvements to facilitate the transfer of passengers between CalTrain and Muni Metro, to improve pedestrian passage within and immediately adjacent to the station, to provide improved access for taxis, to enhance the station design, and to add amenities to the platform loading areas.





**FIGURE 2-2**  
**EXISTING CALTRAIN SYSTEM**



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Other funded capital improvements include rehabilitation of track, stations, locomotives, and passenger cars to maintain the system in "a state of good repair." The purchase of three new locomotives and 17 new passenger cars will allow more equipment to be available for operation for the duration of the rehabilitation program. The new rail cars and station accessibility improvements at ten key stations will ensure compliance with the 1990 federal Americans with Disabilities Act (ADA) requirements.

The JPB has also programmed funds to construct a new train storage and maintenance facility in Santa Clara or San Jose to accommodate CalTrain's needs. This planned new rail maintenance facility was recently downscoped in size so as to accommodate only CalTrain's needs. Improvements to the radio communications system and the installation of 60 additional self-service fare vending machines are also funded.

Ten future grade crossing projects are being undertaken by cities along the CalTrain corridor using San Mateo County Measure "B" and State funds. Federal funds are being used by the City of San Mateo to relocate the San Mateo Station. In addition, the JPB is relocating the Hayward Park Station in San Mateo and relocating the Castro Station in Mountain View to San Antonio Road.

### **2.3.2 Existing Caltrain Terminal and the Mission Bay Plan**

Mission Bay, which is being planned for development by the Catellus Corporation, is an underutilized M-2 (Heavy Industry) Use District (**refer to Figure ---, Project Area**). The Mission Bay project area encompasses approximately 325 acres and is bounded by Townsend Street on the north, Third Street and China Basin Street on the east, Mariposa Street on the south, and Seventh Street on the west. The JPB operates CalTrain on a permanent easement through Mission Bay to the terminal station at Fourth and Townsend. In general, the tracks are situated under the I-280 freeway immediately east of Seventh Street, turning east between King and Townsend Street into the 12-track terminal station area.

Previously owned by the Southern Pacific Transportation Corporation, the area has retained uses related to rail transportation, including rail yards, the CalTrain terminal station, truck terminals, and warehouses. Much of the land is open or vacant although, more recently, unattended parking areas, a lot for recreational vehicles, and a golf driving range have been developed in these open areas.

The Mission Bay Plan, adopted by the San Francisco Planning Commission in September, 1990, designates land use in and around the CalTrain station and storage yard. It is in the process of being revised to incorporate plans for residential and commercial development. The block bordered by Townsend, King, Third, and Fourth Streets and containing the recreational vehicle lot would be the first area planned for development. The block would have residential development with two levels of parking and some retail services located on the ground level. If the Giants baseball stadium were constructed across



Third at King, commercial development would occur on the south side of King between Third and Fourth.

### **2.3.3 Related Muni Light Rail and Bus Service**

JPB staff estimates that over 85 percent of CalTrain commuters who arrive at the Fourth and Townsend terminal use Muni to complete their journey to work. Most of these riders transfer to one of three Muni shuttle bus lines (80X, 81X, and 82X) which operate between the CalTrain terminal and the downtown area during the peak period. In addition to service on the commute shuttles, Muni provides all-day service at Fourth and Townsend on five bus lines; 15-Third, 30-Stockton, 32-Embarcadero, 42-Downtown Loop, and the 45-Union/Stockton (**Figure 2-3**).

Following completion of the Muni Metro Turnback and Muni Metro extension to Sixth and King Boulevard in late 1996, Muni Metro will begin light rail service to the CalTrain terminal. The travel time between Embarcadero Station and the CalTrain terminal is estimated to be 10 minutes. The Muni Metro station at Fourth and King will serve as the last of four new stations on the two-mile extension. The station will be situated immediately west of Fourth Street in the median of an at-grade, double-track exclusive guideway. The high-level boarding platforms are being designed to accommodate four-car trains and allow circulation from both ends of the platform. Ramps will provide access to oversized crosswalks at Fourth Street and mid-block between Fourth and Fifth Streets. Self-service fare vending machines will be located on the east side of the platform and on the sidewalk adjacent the CalTrain terminal. All station facilities are being designed to meet ADA requirements. To the west of the station, between Fifth and Sixth Streets, tail tracks will allow turnbacks of light rail trains.

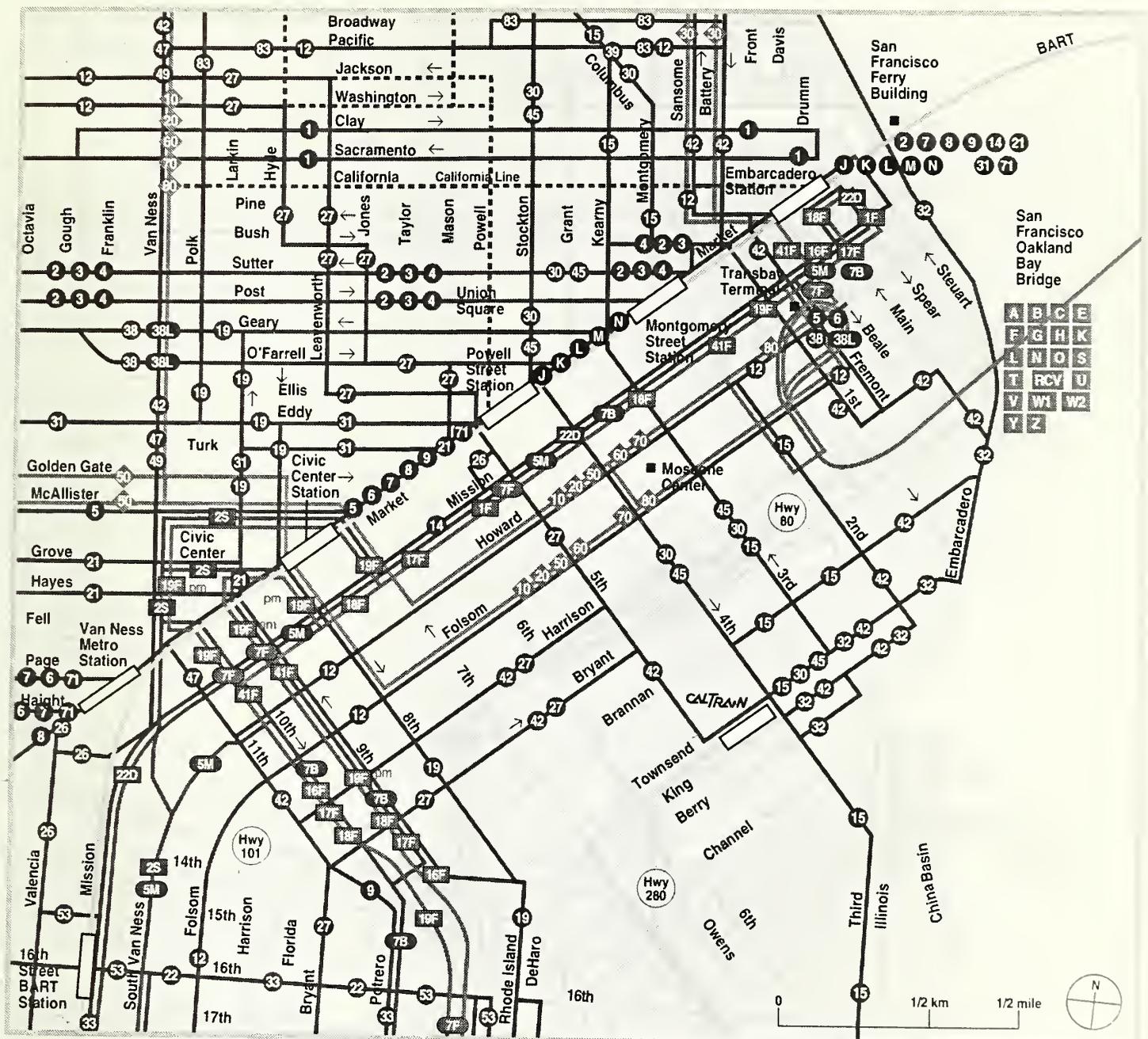
As a result of implementing light rail service on the Muni Metro extension, Muni plans to eliminate duplicate service on the 32-Embarcadero and the 80X and to restructure the routes for the 81X and 82X.

### **2.3.4 Related SamTrans Service**

SamTrans currently operates 86 public transit routes on the Peninsula. The majority of service operates on weekdays between 6:00 a.m. and 7:30 p.m. SamTrans operates 11 routes to the Transbay Terminal where they connect with AC Transit, Muni, and Golden Gate Transit. Eight routes are peak period express service (1F, 16F, 17F, 18F, 19F, 47F, 48F, 49F), one route is an all-day express service (7F), and the remainder are all-day local service (5M and 7B).

SamTrans has restructured routes serving San Francisco in conjunction with the inauguration of BART service to Colma in February 1996. Two routes (2S and 22D) have been truncated at the Colma BART Station. Because of strong public sentiment, two routes that serve Colma BART continue to downtown San Francisco (1F and 5M). However, midday and evening service on Route 5M will be truncated at Colma BART. The 23X





**FIGURE 2-3**  
**TRANSIT SERVICE IN THE PROJECT AREA**



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shuttle operating between the Colma park-and-ride lot and Daly City BART will be eliminated.

### **2.3.5 BART to San Francisco International Airport**

In April 1995, BART and SamTrans selected Alternative VI as the Locally Preferred Alternative for the BART extension to San Francisco International Airport. This alternative extends BART from Colma to South San Francisco, San Bruno, the San Francisco International Airport (SFIA), and terminates in Millbrae. In this scenario, stations would be provided at Hickey Boulevard, Tanforan Shopping Center ~~beneath the planned SFIA International Terminal, and Millbrae Avenue (BART/CalTrain intermodal station).~~

In response to congressional and San Francisco Airport Commission actions, which questioned the cost of implementing Alternative VI, the BART and Samtrans Boards initiated study of reduced-cost ways to gain access to SFIA. The Aerial Design Option to Alternative VI was formulated to bring BART to SFIA via an east-west aerial guideway to an aerial station at the new International Terminal, currently under construction, instead of via subway to an underground station. This design option also would provide through-service along the CalTrain right-of-way, bypassing the Airport, to the Millbrae BART/CalTrain intermodal station. All other segments of Alternative VI remain unchanged.

A supplemental environmental document has been prepared for the Aerial Design Option. After completing the public comment period for the supplemental environmental document, the BART and SamTrans Boards voted on November 28 and 29, 1995, respectively, to modify the LPA to incorporate the Aerial Design Option in the segment south of San Bruno. Preparation of the Final EIS/EIR is expected to be completed in April 1996. Construction of the extension is planned for completion in 2000. Prior to the opening of BART service to SFIA, the JPB intends to modify the CalTrain Millbrae Station to facilitate the transfer of patrons between CalTrain, BART, and, possibly, the Airport's planned light rail line.

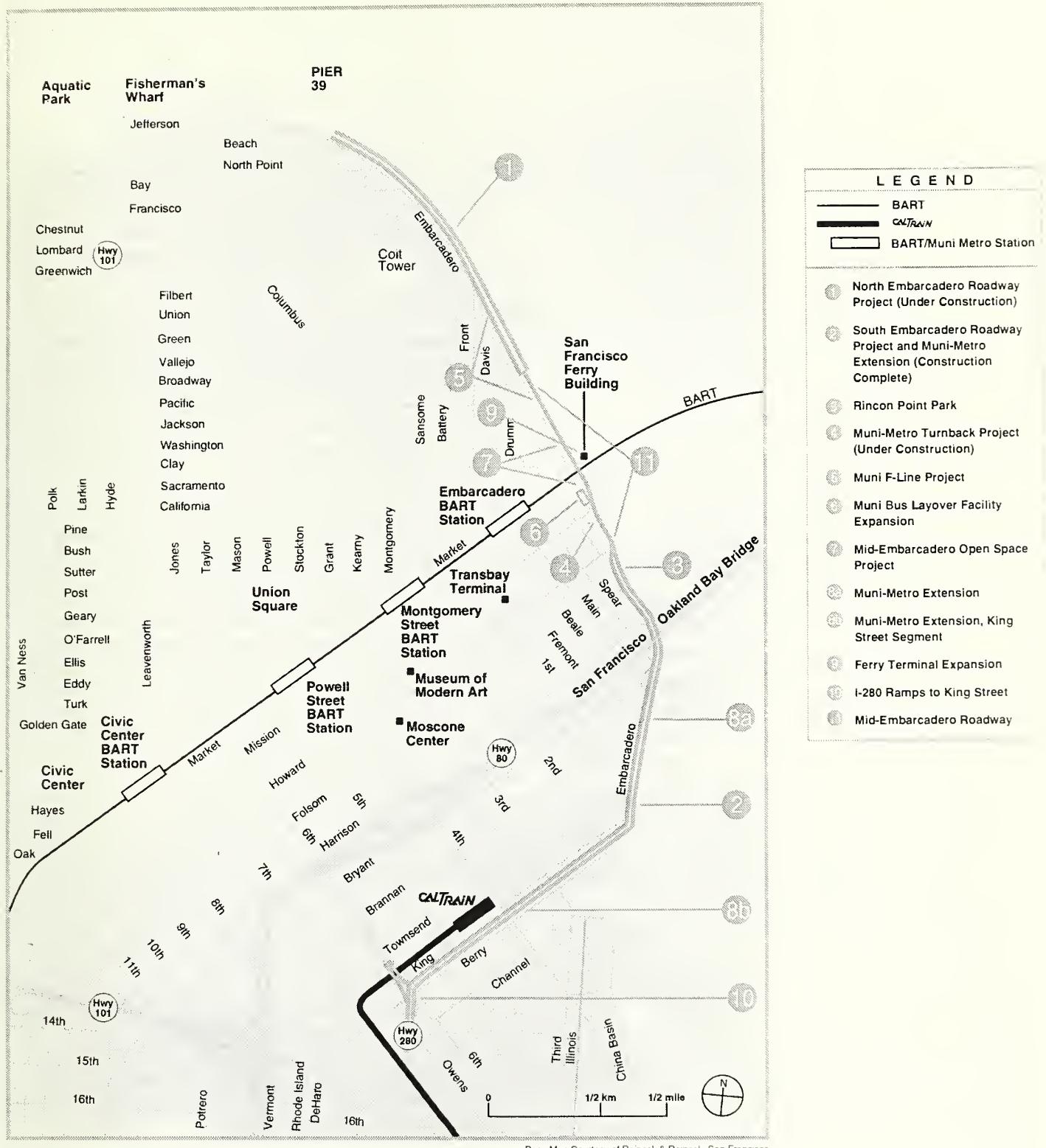
### **2.3.6 Related Road and Highway System**

San Francisco is currently undertaking a series of roadway and transit improvements along the Waterfront that are within the Project Area. The improvements, known as the Waterfront Transportation Projects, extend from the Fisherman's Wharf area to King and Sixth Streets (**Figure 2-4**). The individual projects are described below:

#### ***Embarcadero Roadway - North Segment***

The North Segment of the Embarcadero roadway includes a four-lane surface roadway, the F-line historic streetcar extension in the median of the roadway, a promenade, and landscaping from Broadway to North Point Street. Construction work was completed in November 1995. Street landscaping will be installed in Spring 1996.





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FIGURE 2-4  
WATERFRONT PROJECTS



### ***Embarcadero Roadway - South Segment***

The South Segment of the Embarcadero roadway includes a four-lane surface roadway, Muni Metro extension, a promenade, and landscaping from Folsom Street to Third/King Boulevard. The segment was completed in 1994.

### ***Muni Metro Turnback***

The Turnback Project involves installation of underground track and turnback track from Market Street to Folsom Street. Construction work on Market Street between Steuart and Spear Streets was completed in January 1996. Scheduled completion for the remainder of the project is in September 1996.

### ***King Boulevard and I-280 Connecting Ramp***

King Boulevard is being redesigned as a four-lane surface roadway containing the Muni Metro extension in the median of the roadway, new sidewalks, and landscaping between Third and Sixth Streets. In conjunction with the Waterfront Transportation Projects, Caltrans and the Catellus Corporation are demolishing the stub-end of the I-280 freeway between Third and Sixth Streets. Caltrans will construct new on- and off-ramps linking I-280 and King Boulevard at Fifth Street. Completion of the King Boulevard roadway and the Muni Metro extension to Sixth and King, including station design and the signal preemption system, is scheduled for late 1996. The I-280 stub-end demolition and ramp-work is to be completed in Summer 1997.

### ***Fisherman's Wharf F-line Loop Project***

The F-Line Loop places surface rail on Jefferson, Jones, and Beach Streets, forming a terminal loop for the F-line streetcar at Fisherman's Wharf. Scheduled completion for the work along The Embarcadero from North Point to Powell is in Summer 1996. Construction of the segment from Powell to Jones will commence soon afterward and be completed in late 1998.

### ***Transportation Systems Management Improvements***

Traffic signal and pedestrian improvements on Bay and North Point Streets between Van Ness and The Embarcadero are scheduled for completion in Summer 1996.

### ***Mid-Embarcadero Roadway/Terminal Separator Project***

The Mid-Embarcadero Roadway/Terminal Separator Project is being planned as a replacement for the Embarcadero Freeway and the Terminal Separator ramps which were removed after the Loma Prieta earthquake in 1989. Five alternatives were examined in the DEIS/DEIR, which was published in August 1995.



On January 26, 1996, after substantial public input, the Board of Supervisors selected a Preferred Investment Strategy that: 1) modifies the Fremont Street ramp to provide direct access to Folsom Street; 2) improves the Embarcadero roadway between Broadway and Folsom to six lanes (two lanes would become curbside parking during the off-peak); 3) reopens Davis Street between Clay and Washington Street; and provides a package of surface street and operational improvements. In this scenario, the north-bound and southbound lanes of the Embarcadero roadway would be split in front of the Ferry Terminal with a plaza situated between the lanes. At Washington Street, two left turn lanes would be added to facilitate traffic flow into Chinatown. Provision for a possible future surface light rail spur from The Embarcadero along Washington into Chinatown, as well as the extension of the 83-line on Pacific Street to The Embarcadero, also would be included.

### ***Mid-Embarcadero Open Space Project***

The Open Space Project calls for the redesign of the open area in and around Justin Herman Plaza that was previously occupied by the Embarcadero Freeway and its ramping system from Mission to Washington Streets. The Citizens Advisory Committee recommendations on land use implementation strategies and design guidelines were accepted by the City's Policy Steering Committee in 1994. The Board of Supervisors has authorized the initiation of studies to evaluate the expansion of the Golden Gate Redevelopment project area to include the Clay/Washington parcels vacated as a result of the Embarcadero Freeway demolition. Environmental review and urban design for the Clay/Washington parcels are in process.

## **2.4 ALTERNATIVE 2 - TRANSBAY TERMINAL SITE ALTERNATIVE**

This section describes the various alignment, construction technique, and terminal design options for the Transbay Terminal Site Alternative, the Build Alternative. Section 2.4.1 describes the alignment/construction options, and Section 2.4.2 describes the terminal design options.

### **2.4.1 Alignment Options/Construction Methods**

The alignment for the Build Alternative extends from Mission Bay along Townsend Street curving through Rincon Hill to an underground station at the site of the existing Transbay Terminal, which would be razed (**Figure 2-5**). This section describes the alignment options along Townsend and the north-south mined tunnel options through Rincon Hill to the Transbay Terminal site.

#### ***Townsend Street Options and Possible Portal Locations***

**Option A: Townsend Street Median Alignment/Fourth Street Portal.** The alignment would divert from the existing CalTrain tracks at Berry Street along the east side of Seventh Street. From Seventh and Berry, the two-track alignment would make a



### ***Embarcadero Roadway - South Segment***

The South Segment of the Embarcadero roadway includes a four-lane surface roadway, Muni Metro extension, a promenade, and landscaping from Folsom Street to Third/King Boulevard. The segment was completed in 1994.

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The Turnback Project involves installation of underground track and turnback track from Market Street to Folsom Street. Construction work on Market Street between Steuart and Spear Streets was completed in January 1996. Scheduled completion for the remainder of the project is in September 1996.

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King Boulevard is being redesigned as a four-lane surface roadway containing the Muni Metro extension in the median of the roadway, new sidewalks, and landscaping between Third and Sixth Streets. In conjunction with the Waterfront Transportation Projects, Caltrans and the Catellus Corporation are demolishing the stub-end of the I-280 freeway between Third and Sixth Streets. Caltrans will construct new on- and off-ramps linking I-280 and King Boulevard at Fifth Street. Completion of the King Boulevard roadway and the Muni Metro extension to Sixth and King, including station design and the signal preemption system, is scheduled for late 1996. The I-280 stub-end demolition and ramp-work is to be completed in Summer 1997.

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## **2.4 ALTERNATIVE 2 - TRANSBAY TERMINAL SITE ALTERNATIVE**

This section describes the various alignment, construction technique, and terminal design options for the Transbay Terminal Site Alternative, the Build Alternative. Section 2.4.1 describes the alignment/construction options, and Section 2.4.2 describes the terminal design options.

### **2.4.1 Alignment Options/Construction Methods**

The alignment for the Build Alternative extends from Mission Bay along Townsend Street curving through Rincon Hill to an underground station at the site of the existing Transbay Terminal, which would be razed (**Figure 2-5**). This section describes the alignment options along Townsend and the north-south mined tunnel options through Rincon Hill to the Transbay Terminal site.

#### ***Townsend Street Options and Possible Portal Locations***

**Option A: Townsend Street Median Alignment/Fourth Street Portal.** The alignment would divert from the existing CalTrain tracks at Berry Street along the east side of Seventh Street. From Seventh and Berry, the two-track alignment would make a



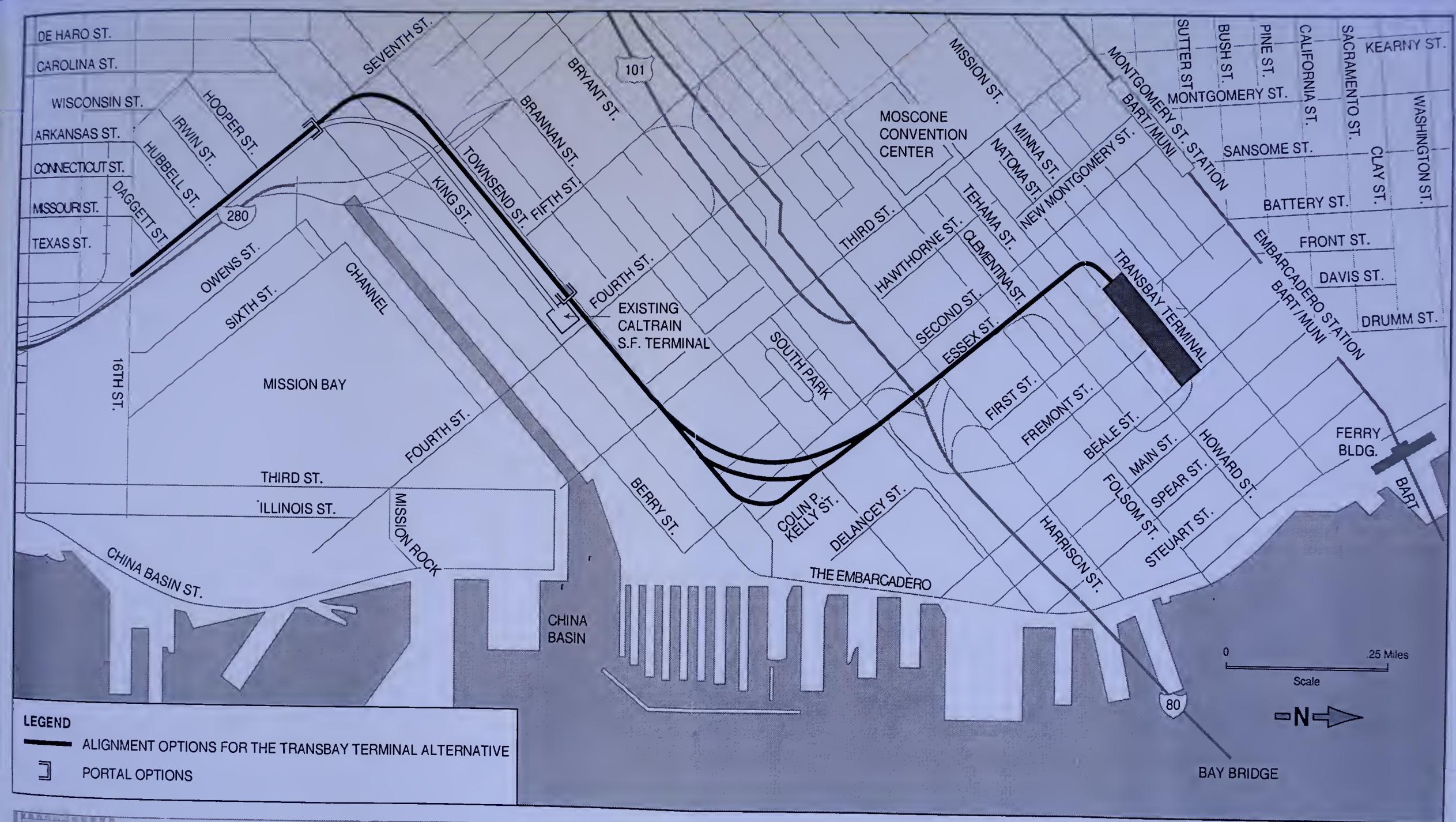


FIGURE 2-5  
TRANSBAY TERMINAL SITE ALTERNATIVE  
ALIGNMENT OPTIONS



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sweeping curve east across King Boulevard and the existing CalTrain storage tracks into the median of Townsend Street (**Figure 2-6**). To accommodate two traffic lanes and one lane for parking/bike path in each direction and 8-foot sidewalks, Townsend would be widened to approximately 147 feet, 63 feet of which would be within Catellus property. Landscaping would border the 25-foot median containing the CalTrain tracks. Grade crossings would occur at Berry, Sixth, and Fifth assuming that these three streets are extended (at present, these three street crossings do not exist), as well as the eastbound lanes of Townsend Street. A parallel third track would serve as a lead track from the station to the CalTrain storage yard.

Immediately east of the I-280 overhead ramps at Sixth Street, a new surface CalTrain station would be constructed and extend to Fifth Street. The surface station would serve Mission Bay and the proposed Giants ballpark. The alignment would descend into a retained, open cut (U-wall) section extending 650 feet to a tunnel portal immediately west of Fourth Street (**Figure 2-7**). The subway alignment, which would continue in the Townsend Street median to about Third Street, would be constructed by cut-and-cover methods (**Figure 2-8**).

**Option B: Townsend Street Southern Alignment/Fourth Street Portal.** Option B would parallel the alignment identified in Option A on the south side of Townsend Street entirely within Catellus property (**Figure 2-9**). A new surface station would be located on this alignment between Sixth and Fifth Streets. The station would contain a third track, which would permit an additional train boarding area and serve as a lead track to the storage yard in Mission Bay.

Past Fifth, the alignment would continue to border Townsend on the south and descend into a portal located west of Fourth Street. In this scenario, the U-wall section would be within Catellus property, avoiding the grade crossing of the two eastbound traffic lanes on Townsend Street that would occur with Option A (**Figure 2-10**). However, grade crossings would occur at Berry, Sixth, and Fifth Streets assuming that these three streets are extended. At present, these three street crossings do not exist. A landscape buffer would separate Townsend Street from the U-wall section. Future Catellus development could be served by a 20-foot alley paralleling the U-wall section on the south. From Fourth, cut-and-cover construction would occur in the Townsend Street median to about Third Street.

**Option C: Townsend Street Underground Alignment/Seventh Street Portal.** Option C involves the longest, and therefore most expensive, underground alignment (**Figure 2-11**). The alignment would descend into a U-wall section from Hooper to Berry Streets along the existing mainline track. The portal location, adjacent Seventh Street at Berry, would require relocating the Division Street trunk-sewer outfall at Mission Creek. A cut-and-cover tunnel would be constructed north along Seventh and then curve to the south side of Townsend Street, remaining in Catellus property (**Figure 2-12**). At Fourth Street, the tunnel alignment would shift into the median of Townsend Street and continue on tangent past Third. The longer tunnel alignment would allow the extension of Fifth and Sixth Streets into Mission Bay without requiring grade crossings of CalTrain tracks.



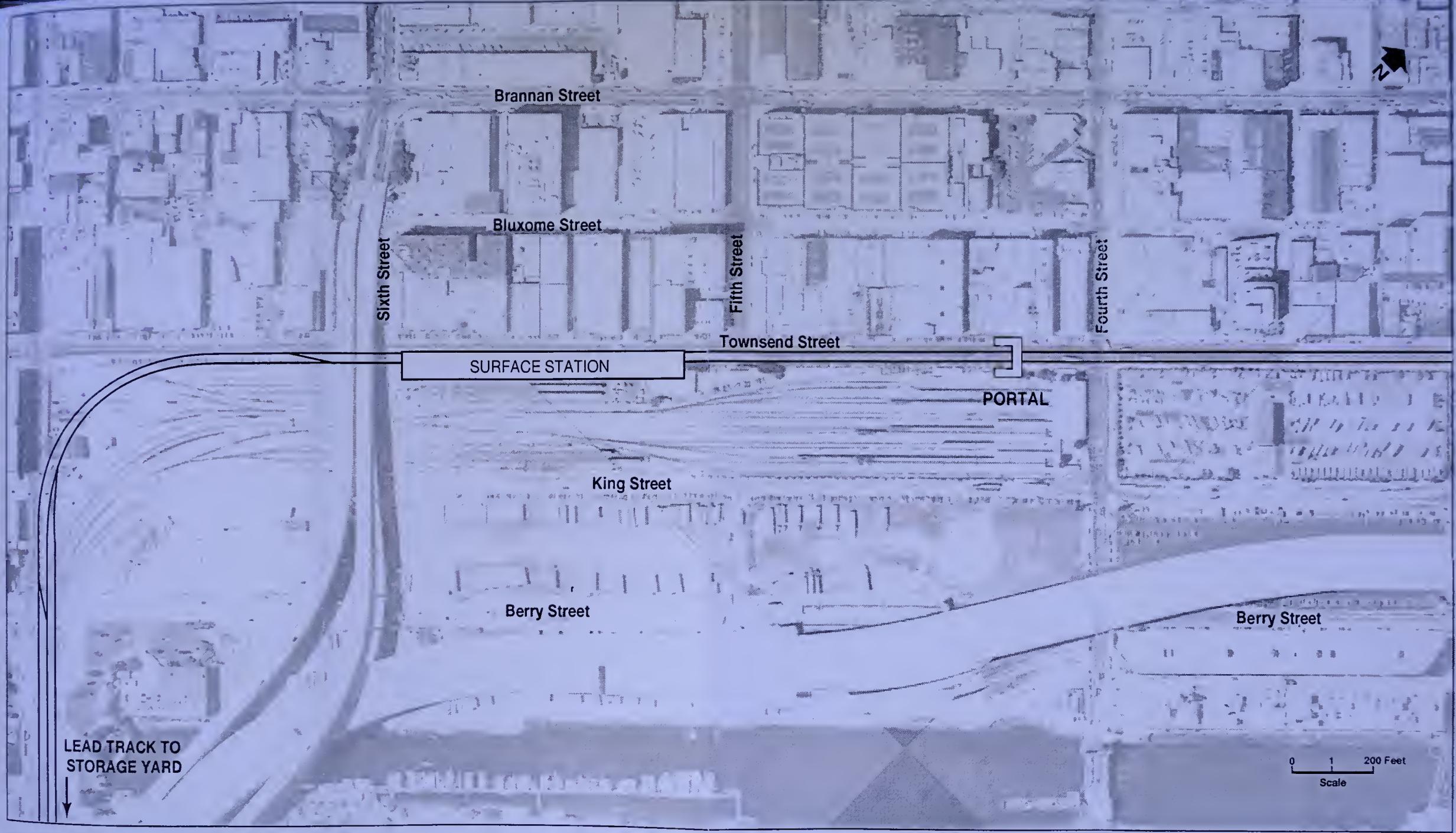


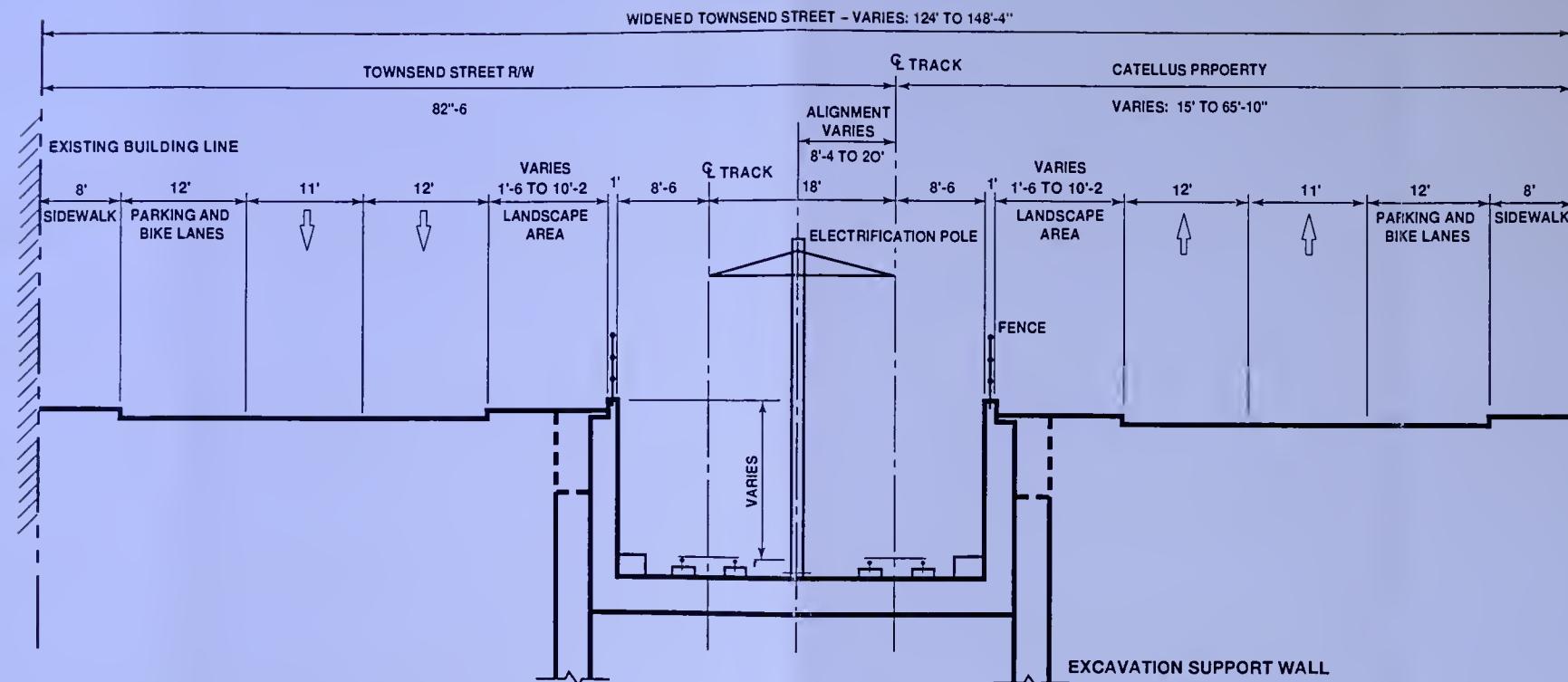
FIGURE 2-6  
TRANSBAY TERMINAL SITE ALTERNATIVE:  
TOWNSEND STREET ALIGNMENT  
OPTION A



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0 6 12 Feet  
Scale

FIGURE 2-7  
TOWNSEND STREET ALIGNMENT  
U-WALL CROSS SECTION  
OPTION A



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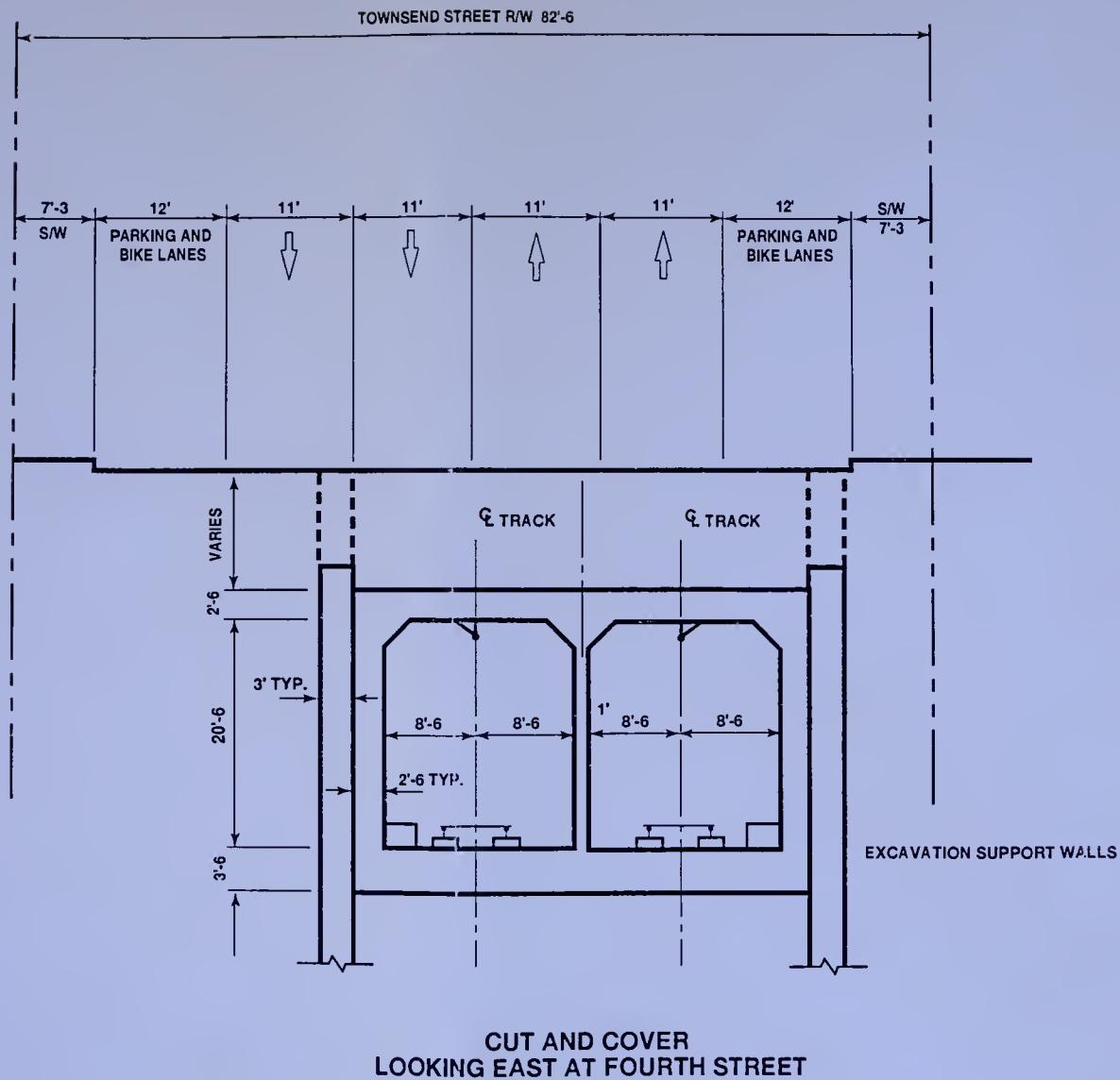


FIGURE 2-8  
TOWNSEND STREET ALIGNMENT  
TUNNEL CROSS SECTION  
OPTION A, B & C

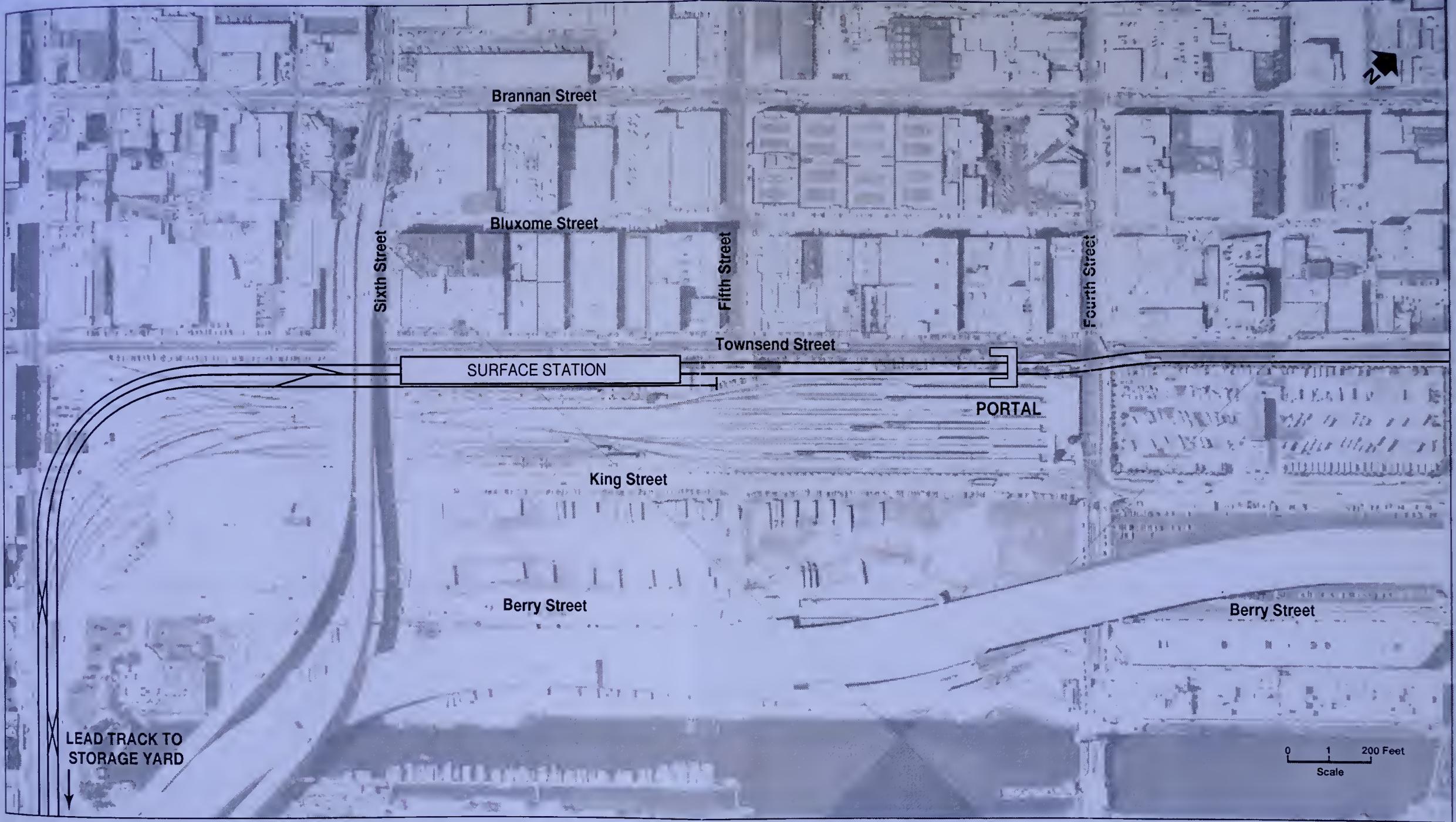


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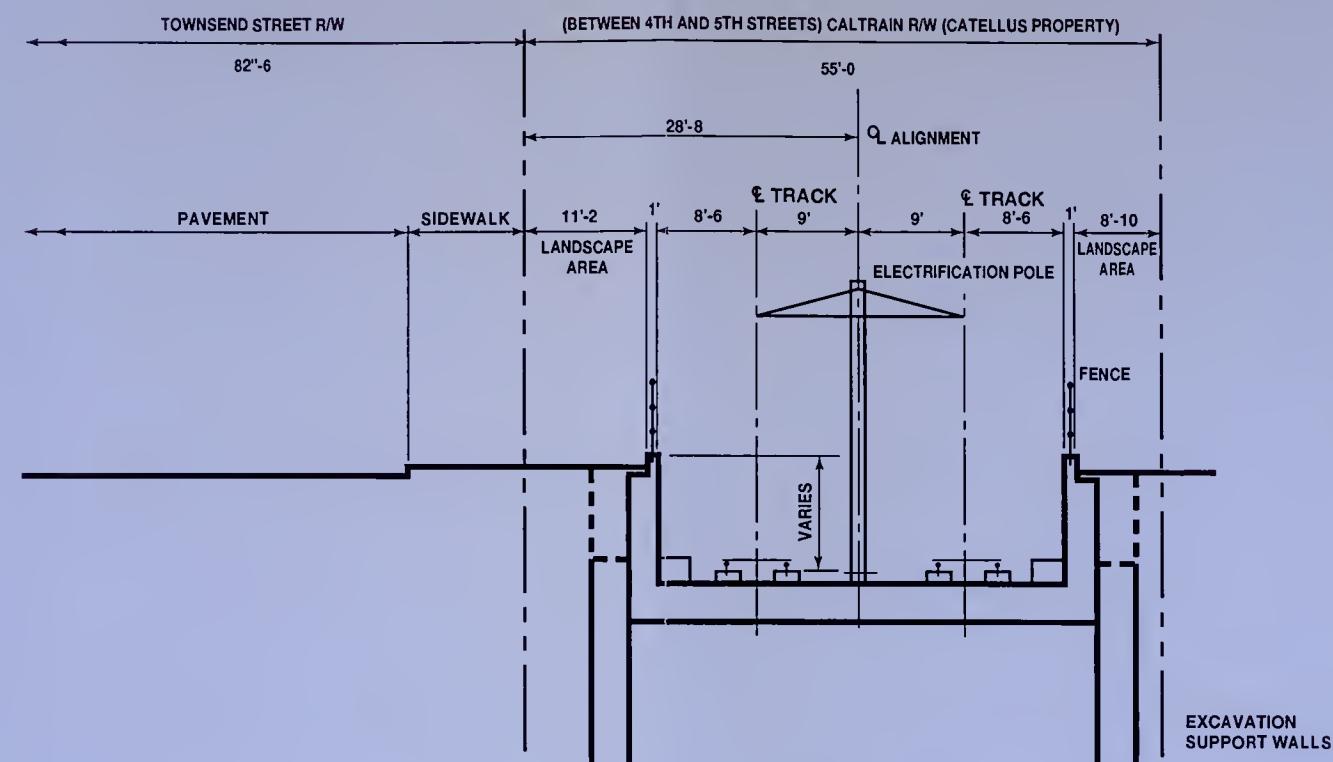


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FIGURE 2-9  
TRANSBAY TERMINAL SITE ALTERNATIVE:  
TOWNSEND STREET ALIGNMENT  
OPTION B





RETAINED CUT TRANSITION  
LOOKING EAST AT FIFTH STREET

0 6 12 Feet  
Scale

FIGURE 2-10  
TOWNSEND STREET ALIGNMENT  
U-WALL CROSS SECTION  
OPTION



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FIGURE 2-11  
TRANSBAY TERMINAL SITE ALTERNATIVE:  
TOWNSEND STREET ALIGNMENT  
OPTION C



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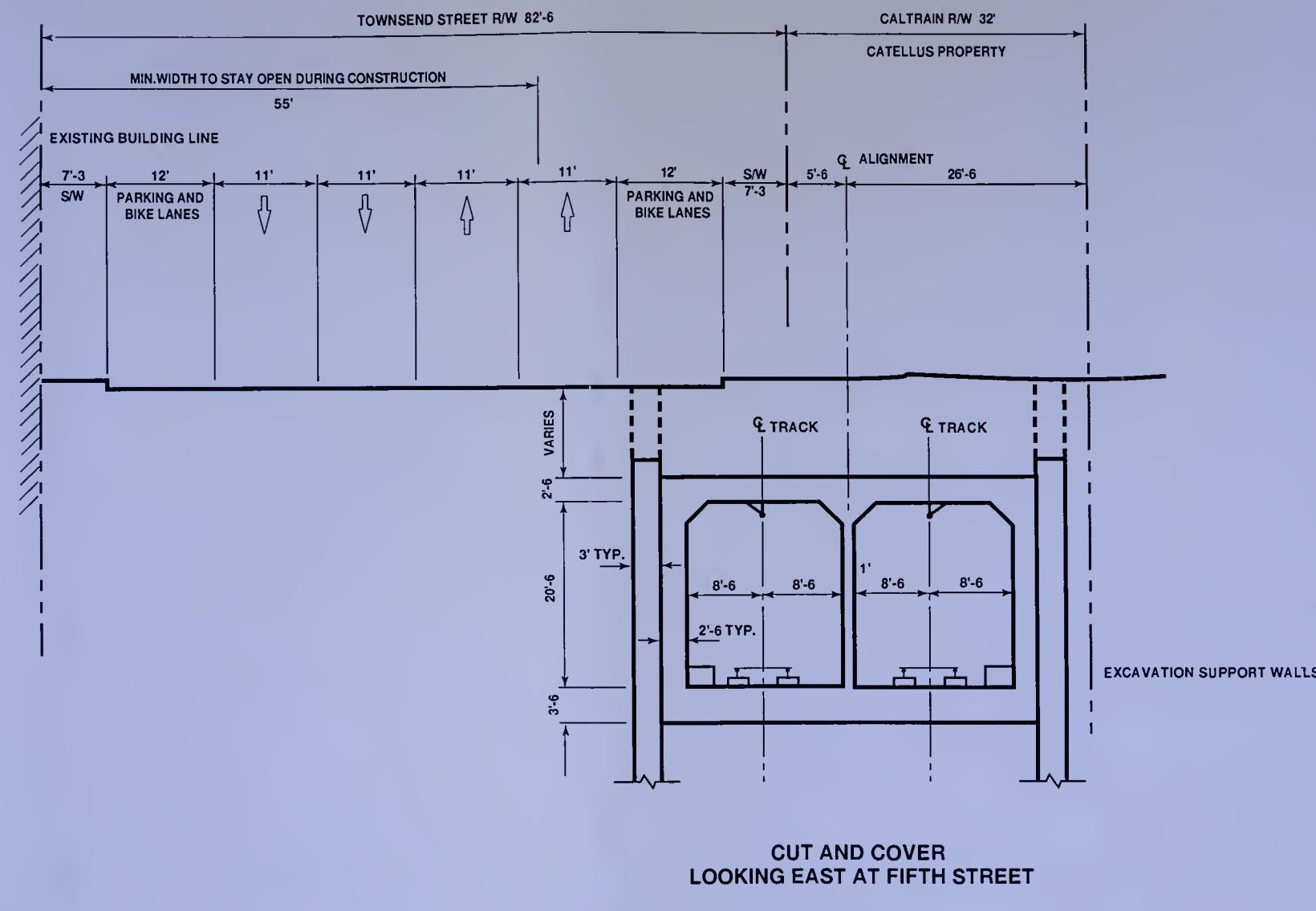


FIGURE 2-12  
 TOWNSEND STREET ALIGNMENT  
 TUNNEL CROSS SECTION  
 OPTION C



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However, a station at Mission Bay is not included in this scenario because it would cost an additional \$40 million.

A summary of the three Townsend Street alignment options is presented in Table 2-1.

**TABLE 2-1: TOWNSEND STREET ALIGNMENT OPTIONS**

	OPTION A	OPTION B	OPTION C
Alignment	Median of Widened Townsend	South Side of Townsend	Subway Under South Side of Townsend
Portal	Fourth Street	Fourth Street	Seventh/Berry Streets
Mission Bay Station/ No. of Tracks at Station	Yes/2	Yes/3	No (would cost \$40 million total)
Parallel Third Track to Storage Yard	Yes	Yes	Yes
Cost	+\$10 million	Base	+\$100 million

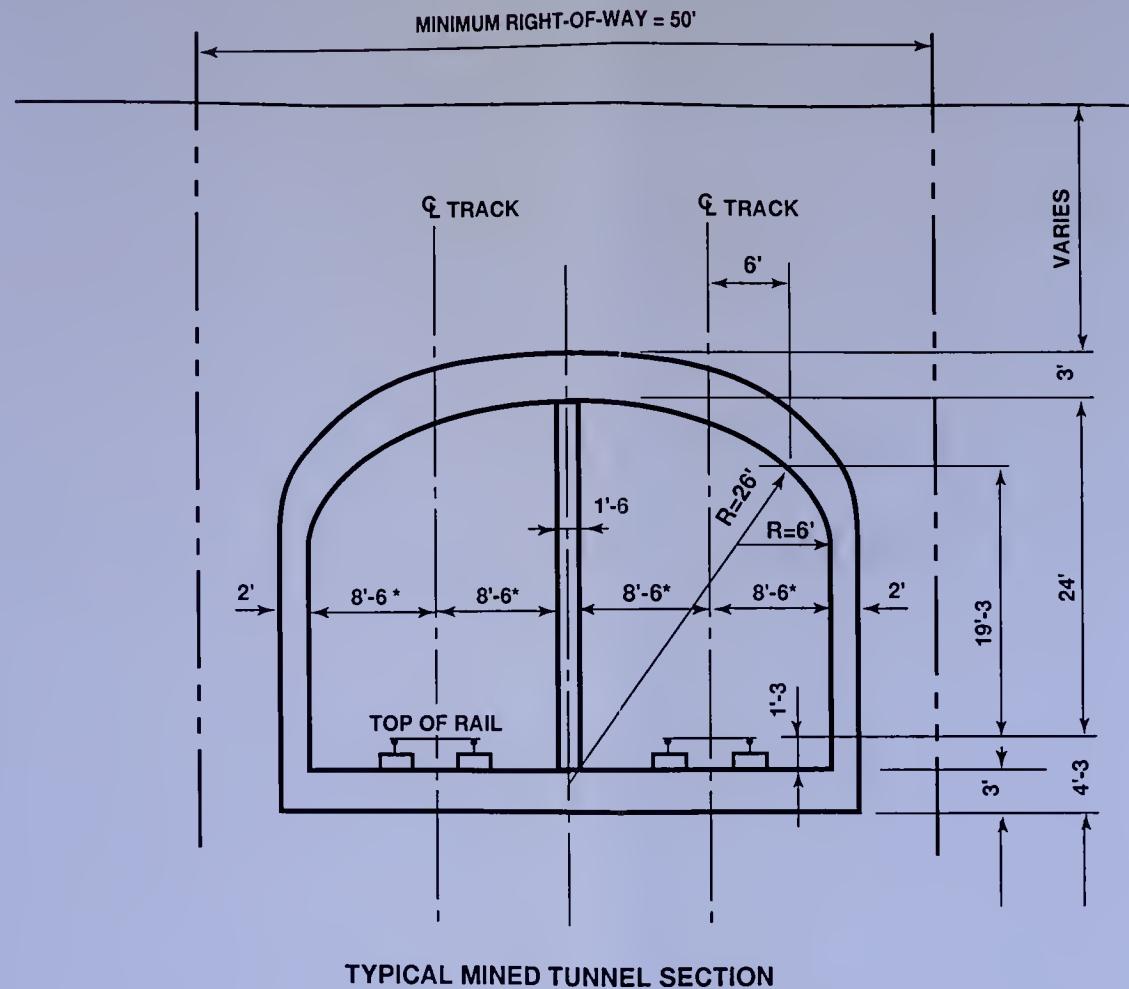
#### ***North-South Mined Tunnel Options - Townsend to Folsom***

Near Third Street, an access shaft would be constructed to excavate an approximately 4,000-foot long mined tunnel under a historic warehouse district and Rincon Hill to a location west of an extension of Essex Street just north of Folsom. Although the depth of the mined tunnel would vary, the cross section would remain relatively constant (**Figure 2-13**). A second access shaft would be located at the northern end of the mined tunnel. The mined tunnel alignment options, indicated in **Figure 2-14**, are described below.

**Short-Radius Mined Tunnel Option.** The short-radius mined tunnel alignment would descend as it proceeds under Townsend to Second Street. At Second, the short-radius mined tunnel would turn 90 degrees north, passing under 699 Second Street, 62 Colin P. Kelly (historic structure), and 52 Colin P. Kelly before entering the Colin P. Kelly Street right-of-way. To ensure the structural integrity of these buildings, the mined tunnel would be positioned approximately 25 feet below the building foundations. (**Figure 2-15**). The mined tunnel would pass under Brannan Street proceeding north on tangent under South Beach Billiards, 60 Federal Way, and 355 Bryant (The Lofts). North of Bryant Street, the mined tunnel would continue under the I-80 structure and ramps, following the Essex Street right-of-way. It may be necessary to raise the South Beach Billiards building in order to construct a third tunnel construction access shaft and a large tunnel ventilation shaft and fanroom at this location.

**Medium-Radius Mined Tunnel Option.** The medium-radius mined tunnel would descend under Townsend and curve 90 degrees to the north at Stanford Street. The tunnel would pass under 130 Townsend (historic structure), the San Francisco Fire Department's





0      6      12 Feet  
Scale

**FIGURE 2-13**  
**NORTH-SOUTH MINED TUNNEL**  
**ALIGNMENT CROSS SECTION**  
**LONG, MEDIUM & SHORT OPTIONS**

♦ ICF KAUSER/DELEAU

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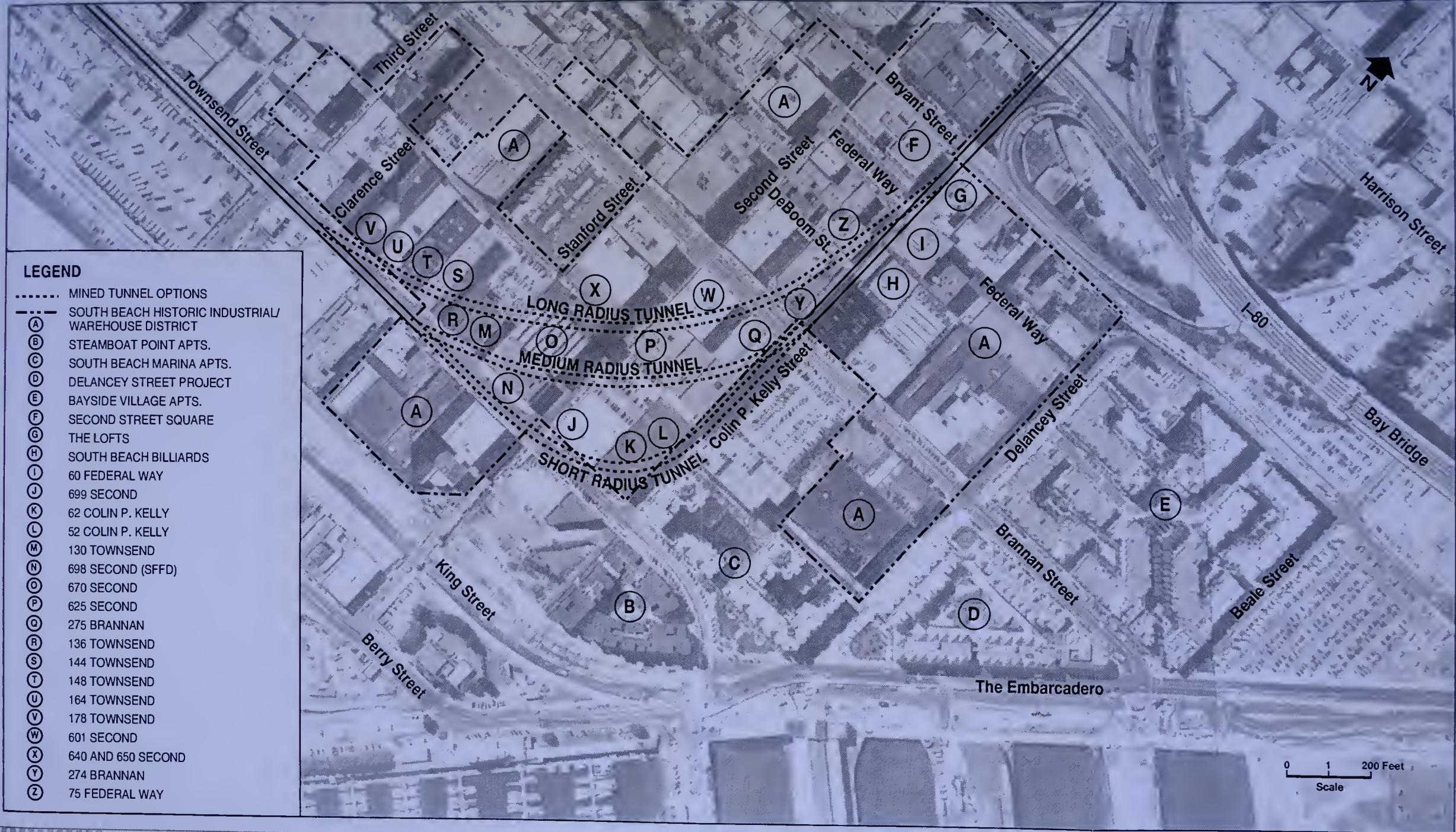


FIGURE 2-14  
TRANSBAY TERMINAL SITE ALTERNATIVE:  
SHORT, MEDIUM AND LONG RADIUS MINED TUNNEL OPTIONS



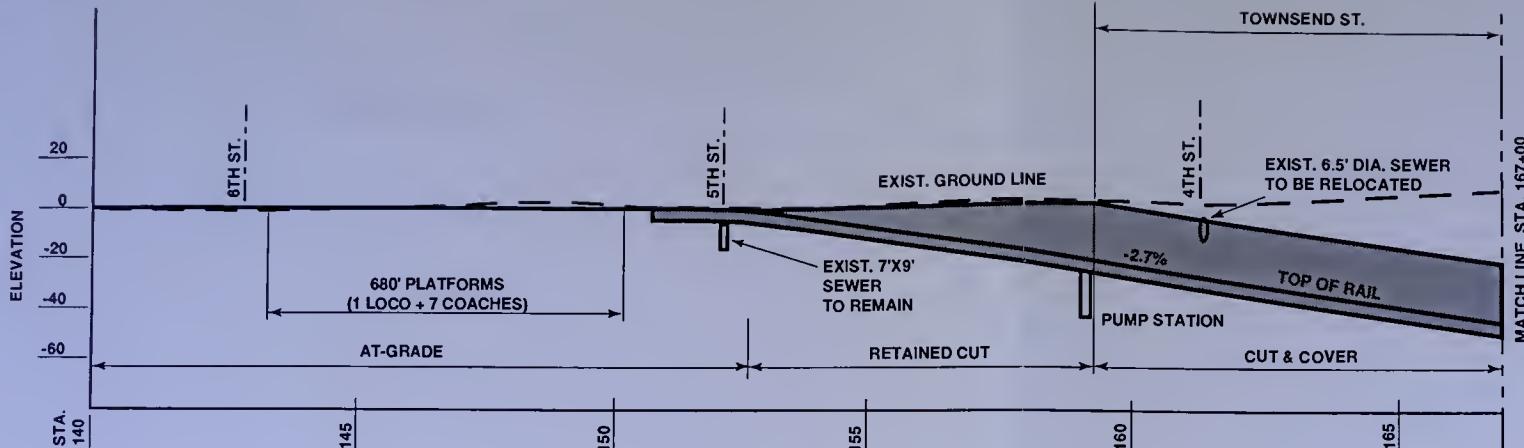
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DOWNTOWN EXTENSION PROJECT

PENINSULA CORRIDOR JOINT POWERS BOARD

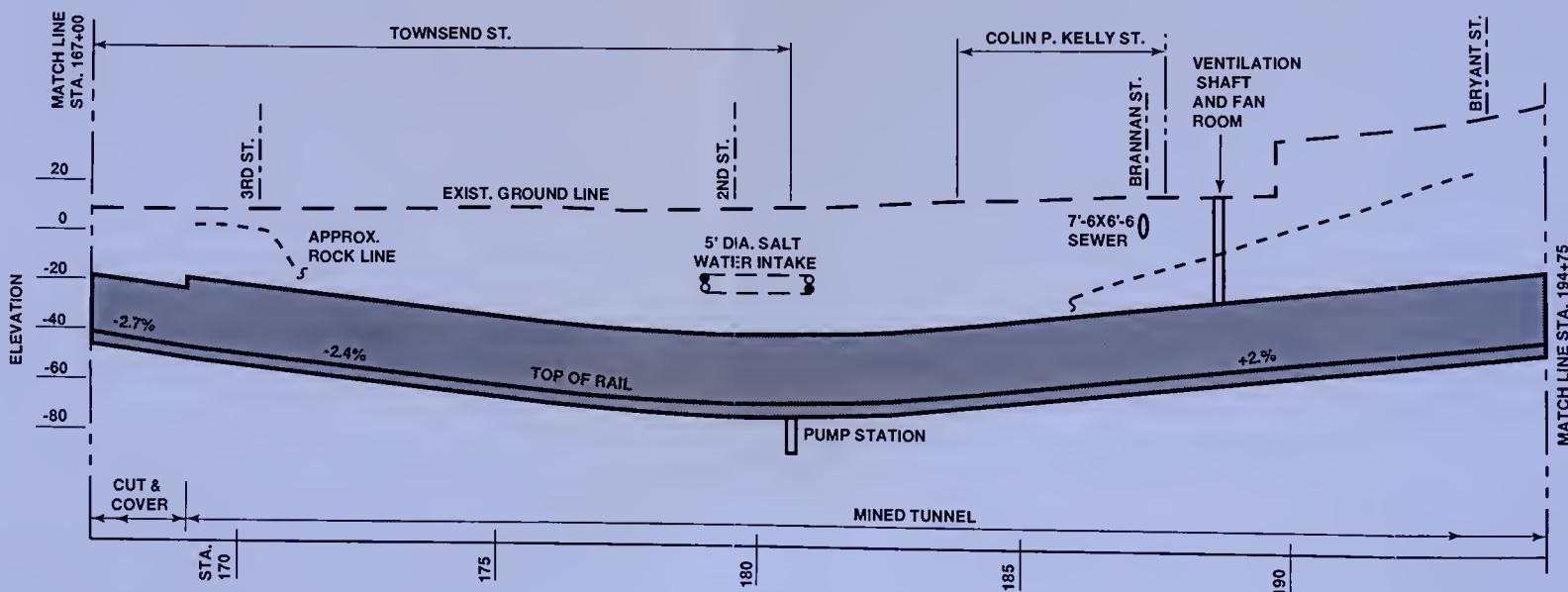
◆ ICF KAUSER/DELEUF

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PROFILE OPTIONS A & B



PROFILE SHORT

0 30 60 Feet  
Vert. Scale

0 150 300 Feet  
Horiz. Scale

FIGURE 2-15  
SHORT RADIUS MINED TUNNEL PROFILE



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J96-026, 2-156 Mac



building at 698 Second, 670 Second, 625 Second (Southend Warehouse historic structure), and 275 Bryant before entering the Colin P. Kelly right-of-way (**Figure 2-16**). The Fire Department has a subterranean salt water intake and pump station located under a portion of 698 Second. The alignment is planned to avoid this subterranean facility. North of Colin P. Kelly, the medium- and short-radius mined tunnels follow the same alignment through Rincon Hill to Essex/Folsom. It may be necessary to raise the South Beach Billiards building in order to construct a third tunnel construction access shaft and a large tunnel ventilation shaft and fanroom at this location.

**Long-Radius Mined Tunnel Option.** The long-radius mined tunnel would begin curving north under Block --- immediately east of Third Street. The elongated curvature of this mined tunnel option would pass under three blocks and 13 buildings (**Figure 2-17**). These buildings include: 130, 136 (historic structure), 144, 148, 164, and 178 Townsend Street; 601, 625 (Southend Warehouse historic structure), 640, 650, and 670 Second Street; 274 Brannan; and Licorice Square (18 DeBoom). In this option, South Beach Billiards and 60 Federal Way would not be affected. The long mined tunnel would follow the alignment of the short- and medium-radius mined tunnels at 355 Bryant and continue under the I-80 structure and ramps to Essex/Folsom.

#### *Cut-and-Cover Tunnel to Transbay Terminal Site*

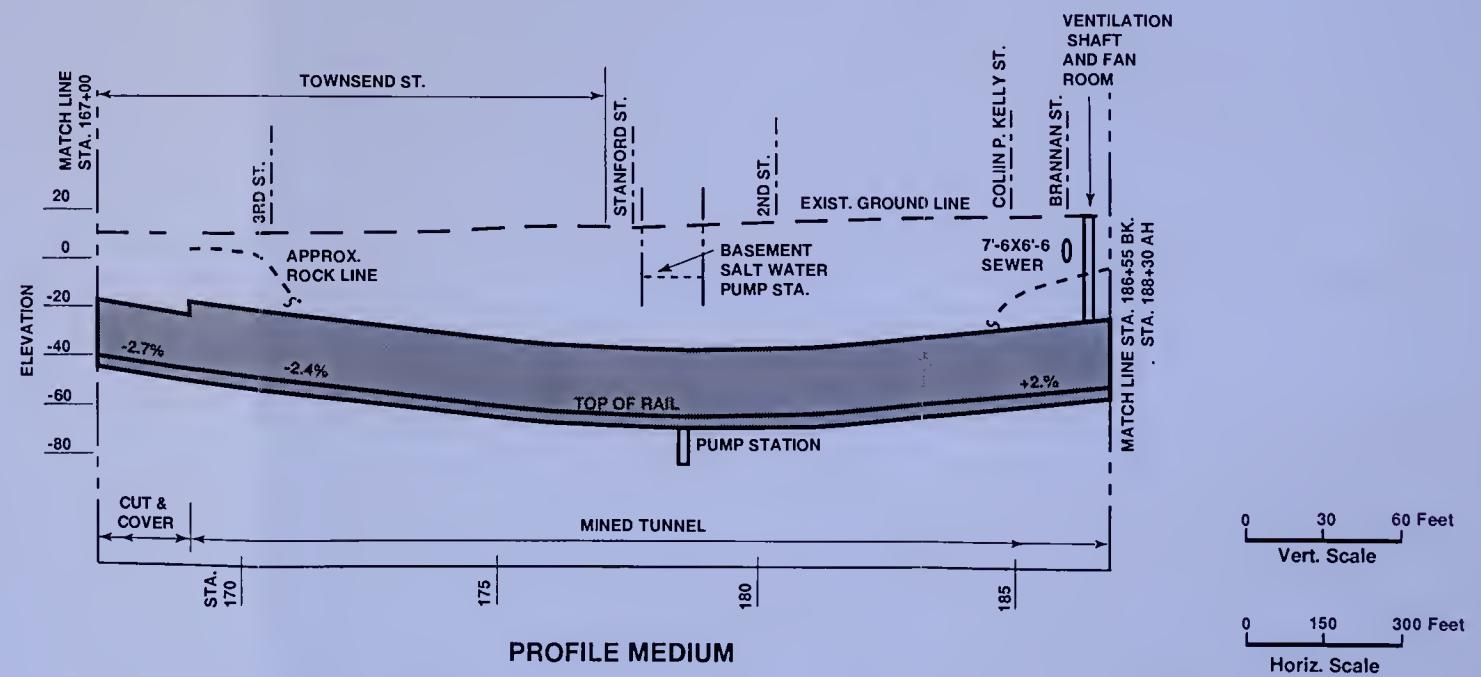
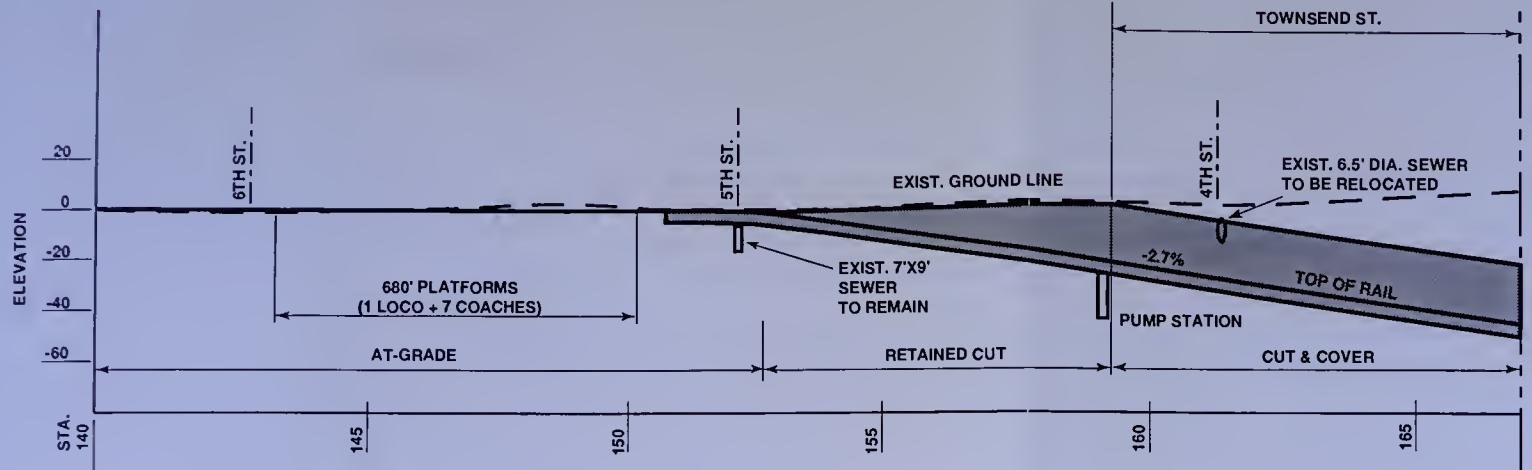
Just north of Folsom at Essex, a second access shaft would denote the transition from mined tunnel to cut-and-cover tunnel construction. The cut-and-cover construction would follow the right-of-way for the existing outbound bus access ramp that leads from the Transbay Terminal to the Bay Bridge. This aerial bus ramp would have to be demolished to allow construction of the CalTrain subway alignment. The alignment would turn 90 degrees east just after crossing Howard Street and branch from two to six tracks to reach the Transbay Terminal site. Portions or all of five properties - 530, 540, 546, and 555 Howard, and 55 Natoma - would need to be acquired to gain sufficient right-of-way for six tracks (**Figure 2-18**).

A summary of the north-south mined tunnel options is presented in Table 2-2.

**TABLE 2-2: NORTH-SOUTH MINED TUNNEL OPTIONS**

	SHORT-RADIUS OPTION	MEDIUM-RADIUS OPTION	LONG-RADIUS OPTION
Alignment	Under 1 block	Under 2 blocks	Under 3 blocks
Historic Properties Above Tunnel	1	2	2
Tunneling Method	TBD	TBD	TBD
Cost	Base	??	??





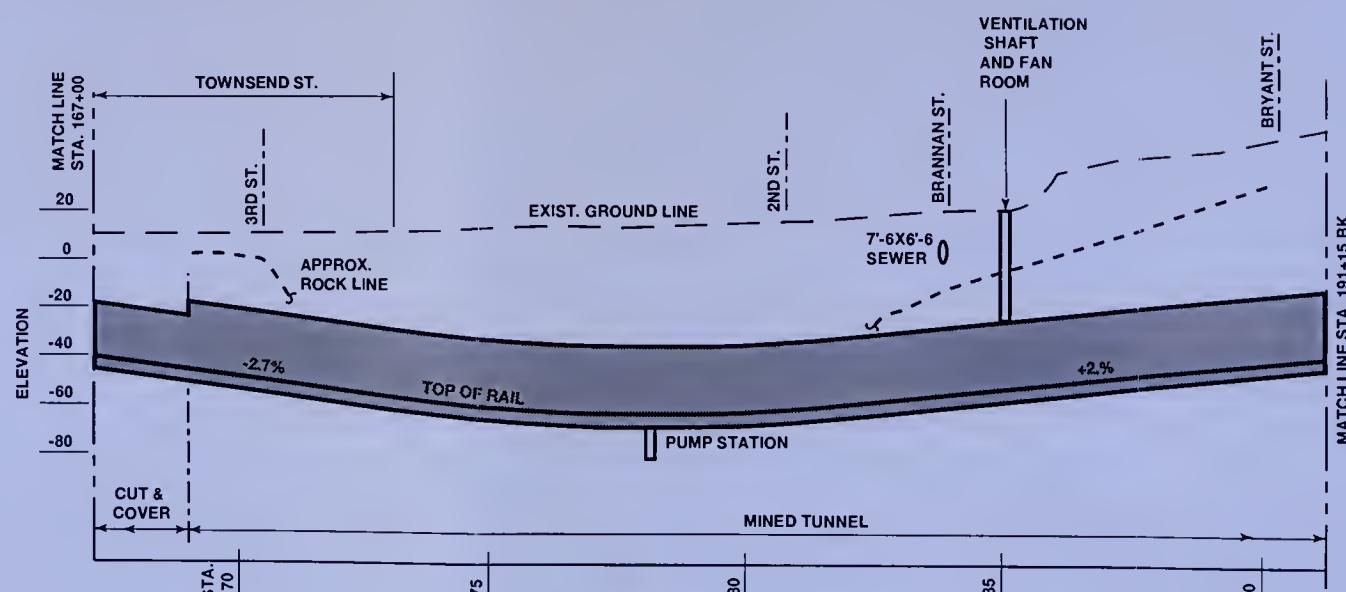
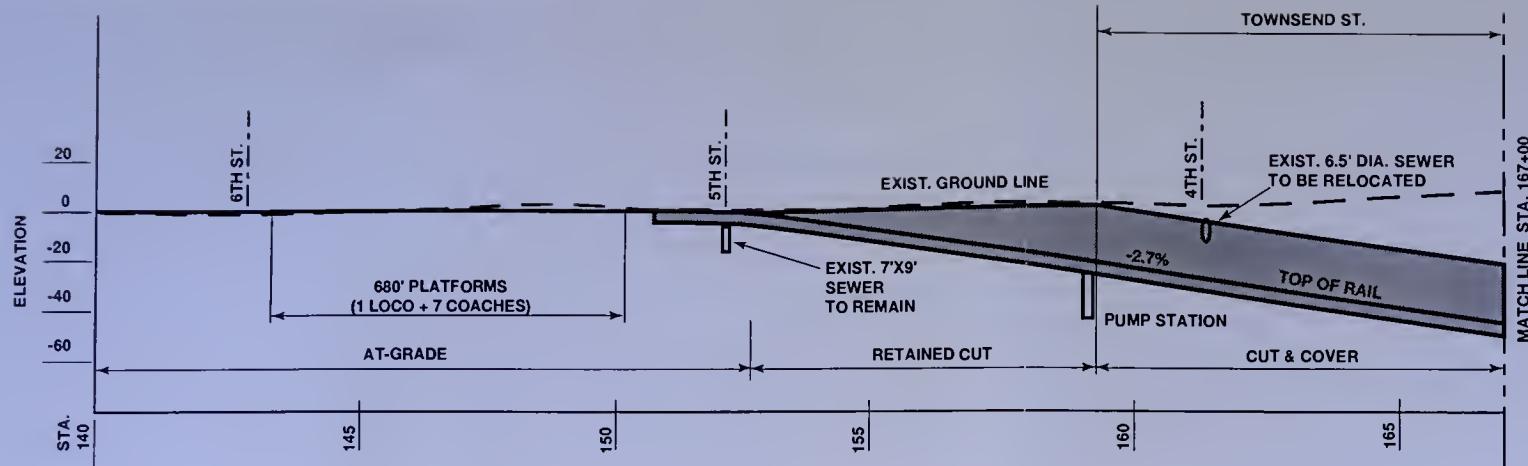
**FIGURE 2-16**  
**MEDIUM RADIUS MINED TUNNEL PROFILE**



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**FIGURE 2-17**  
**LONG RADIUS MINED TUNNEL PROFILE**



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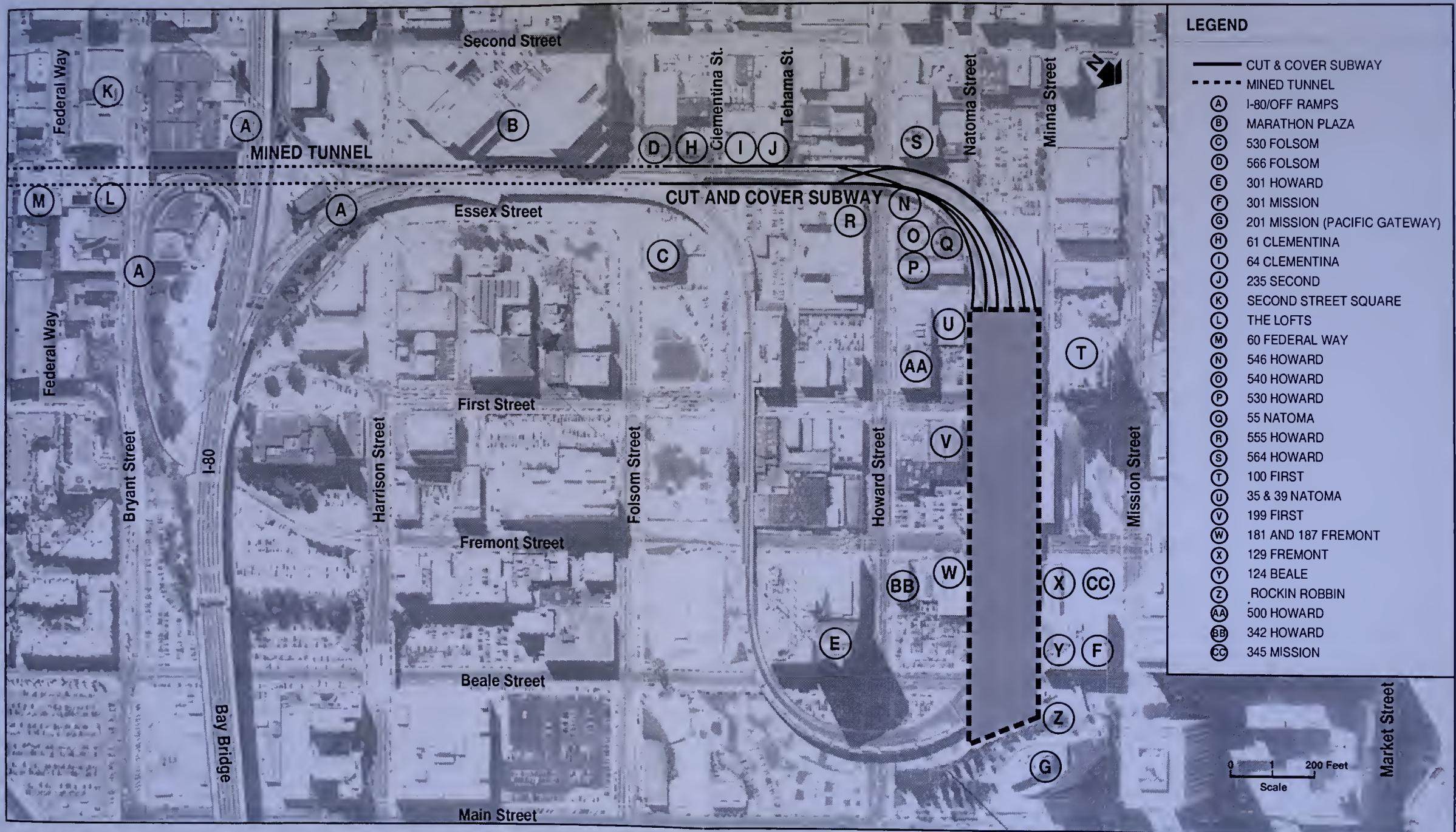
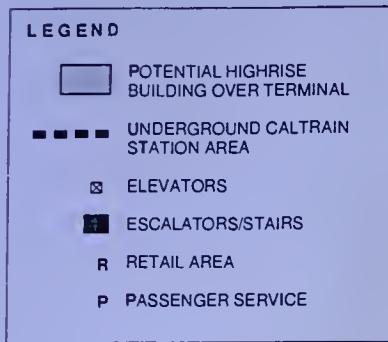


FIGURE 2-18  
TRANSBAY TERMINAL SITE ALTERNATIVE:  
UNDERGROUND TERMINAL LOCATION

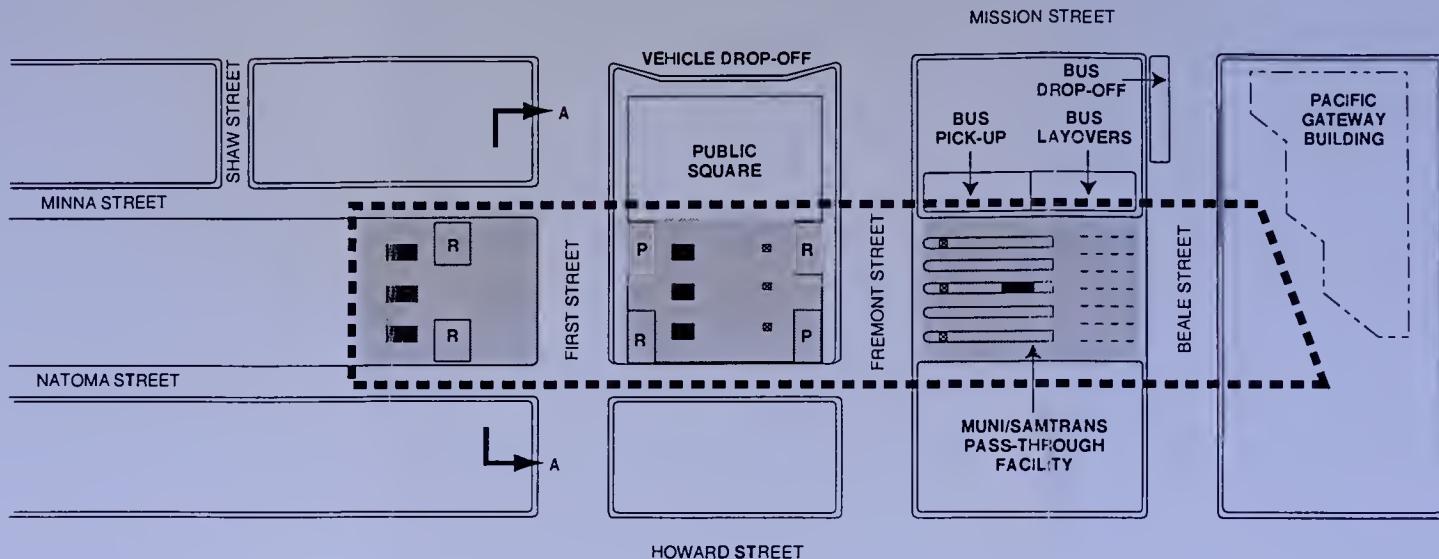


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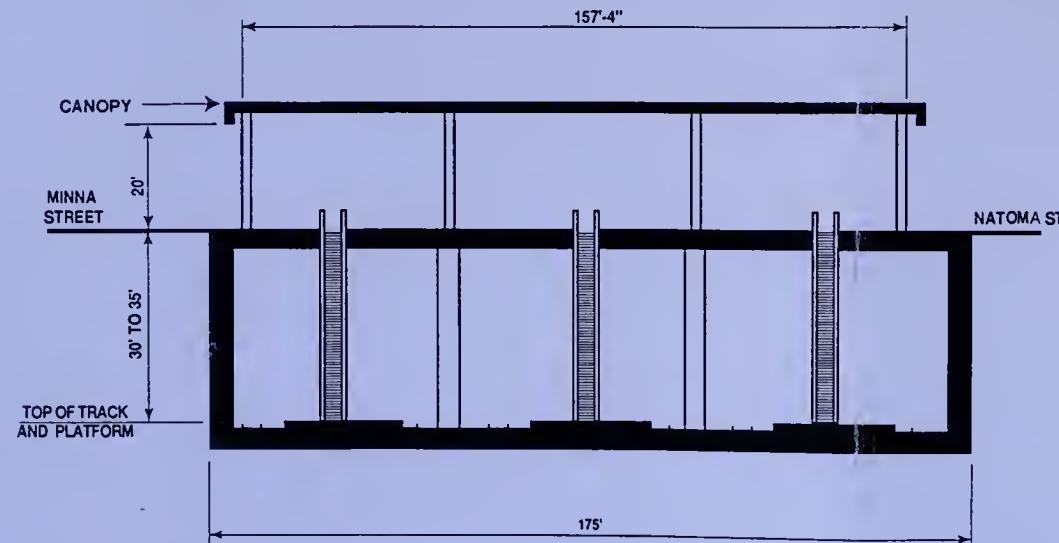




NOTE: DESIGNS ARE CONCEPTUAL - THEY ARE INTENDED TO ILLUSTRATE CONFIGURATIONS, NOT ARCHITECTURAL DESIGN.



### STREET LEVEL PLAN



### SECTION A-A

0 100 200 Feet  
Plan - Scale

0 25 50 Feet  
Section - Scale

FIGURE 2-19  
CALTRAIN UNDERGROUND STATION  
AT TRANSBAY TERMINAL SITE



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#### **2.4.2 Underground Station at the Transbay Terminal Site**

The underground station would encompass the existing Transbay Terminal footprint and the width of Natoma Street, which parallels the site immediately to the south (**Figure 2-19**). Six tracks and three center platforms, each 850 feet long and 28 feet wide, would serve boarding and disembarking CalTrain and future high speed rail passengers. Each platform would have escalator and stair access to street level. Structural columns would be positioned between the tracks and on the platforms in order to support a wide variety of possible future developments above the station.

If AC Transit's and Greyhound's buses were relocated to Main/Beale, the underground station could have passenger services either on the surface (with a canopied plaza entry area between First and Fremont Streets fronting on Mission) or on the platforms below. In either case, joint development and/or a public open space could occupy the unused portions of the street level area and air rights above.

The underground station would incorporate a 950-foot concourse under Beale Street from Market to Natoma Streets connecting CalTrain with BART/Muni Metro at the Embarcadero Station. A Muni/Samtrans surface bus terminal would be located at the east end of the Transbay Terminal site on the block between Fremont and Beale Streets (called the "Beale/Fremont Pass-through Facility").

#### **2.4.3 Mitigation Options for the Transbay Bus Terminal**

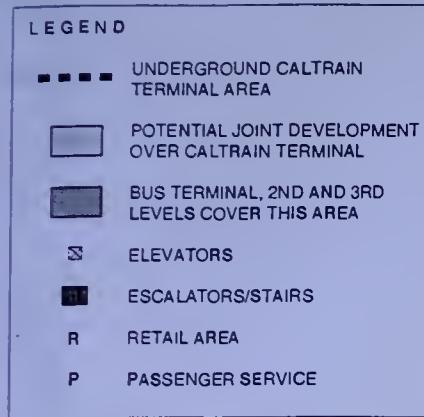
Implementing the Build Alternative would require the demolition of the existing Transbay Terminal building and connecting bus ramps. The bus terminal would be replaced as a mitigation for project implementation. The following options are being considered: 1) replace the existing bus terminal with a new bus facility between Main and Beale south of the Pacific Gateway Building; 2) construct the bus terminal above the underground CalTrain station at the existing Transbay Terminal site; and 3) replace the existing facility with a surface bus terminal between Main and Beale south of the Pacific Gateway Building. These options are described below.

##### ***Option A: New Bus Facility at Main/Beale***

Option A would combine an underground CalTrain station on the site of the existing Transbay Terminal with a new three-level bus facility on a site bounded by Beale, Main, Folsom and the southern perimeter of the Pacific Gateway property (**Figure 2-20**). New exclusive aerial ramps, which would provide grade-separated bus access between the Bay Bridge and the second and third levels of the terminal, would contain storage area for approximately 80 AC Transit buses (**Figure 2-20A**). Eighty vanpool parking spaces would occupy the area underneath the ramps.

Passenger ticketing and 35,000 to 50,000 square feet of retail services would occur at street level (**Figure 2-21**). AC Transit, Greyhound, Amtrak, and Airporter buses would

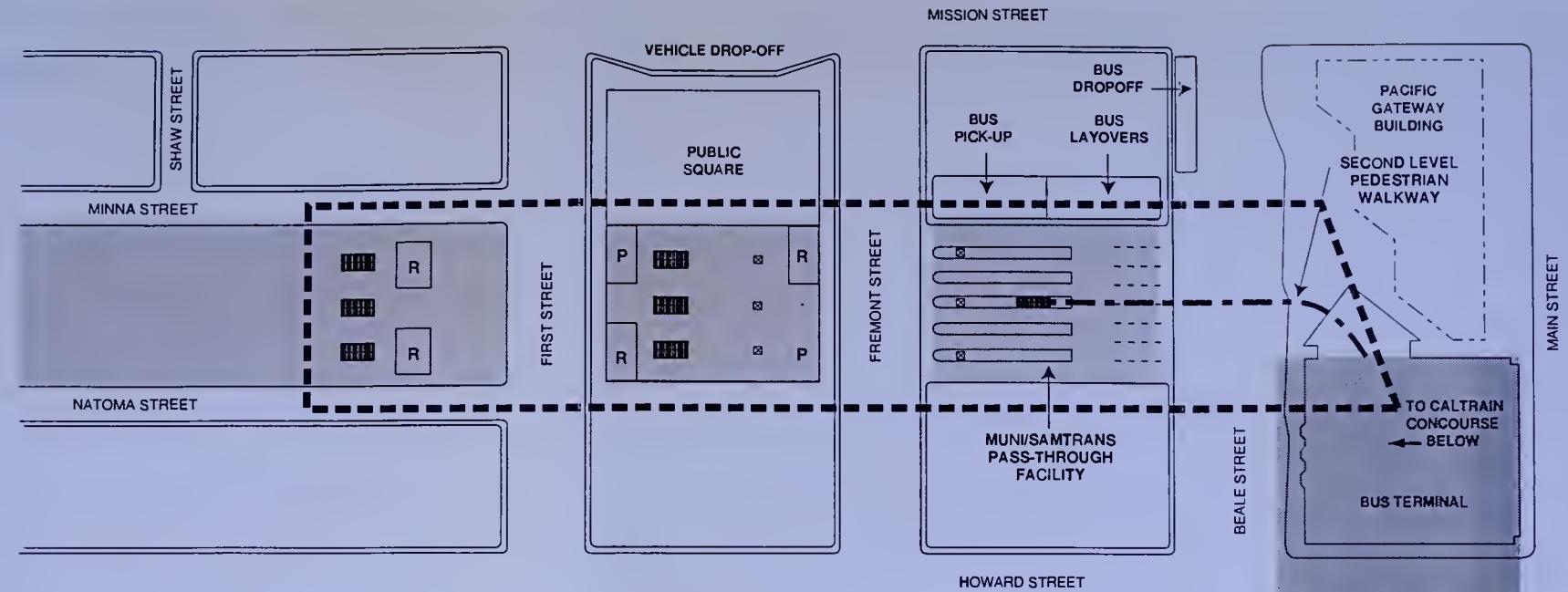




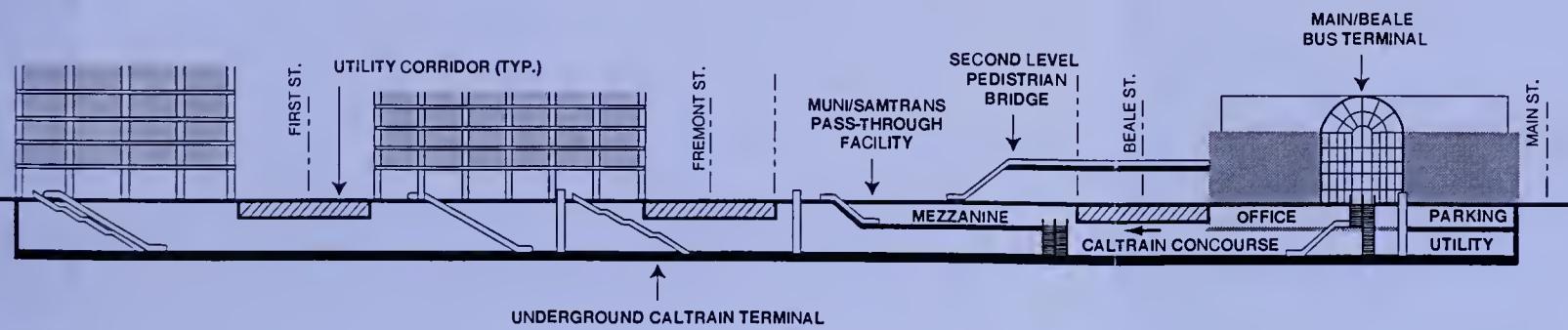
NOTE: DESIGNS ARE CONCEPTUAL - THEY ARE INTENDED TO ILLUSTRATE CONFIGURATIONS, NOT ARCHITECTURAL DESIGN.

0 100 200 Feet  
Plan - Scale

0 100 200 Feet  
Section - Scale



### STREET LEVEL PLAN



### LONGITUDINAL SECTION

FOLSOM STREET



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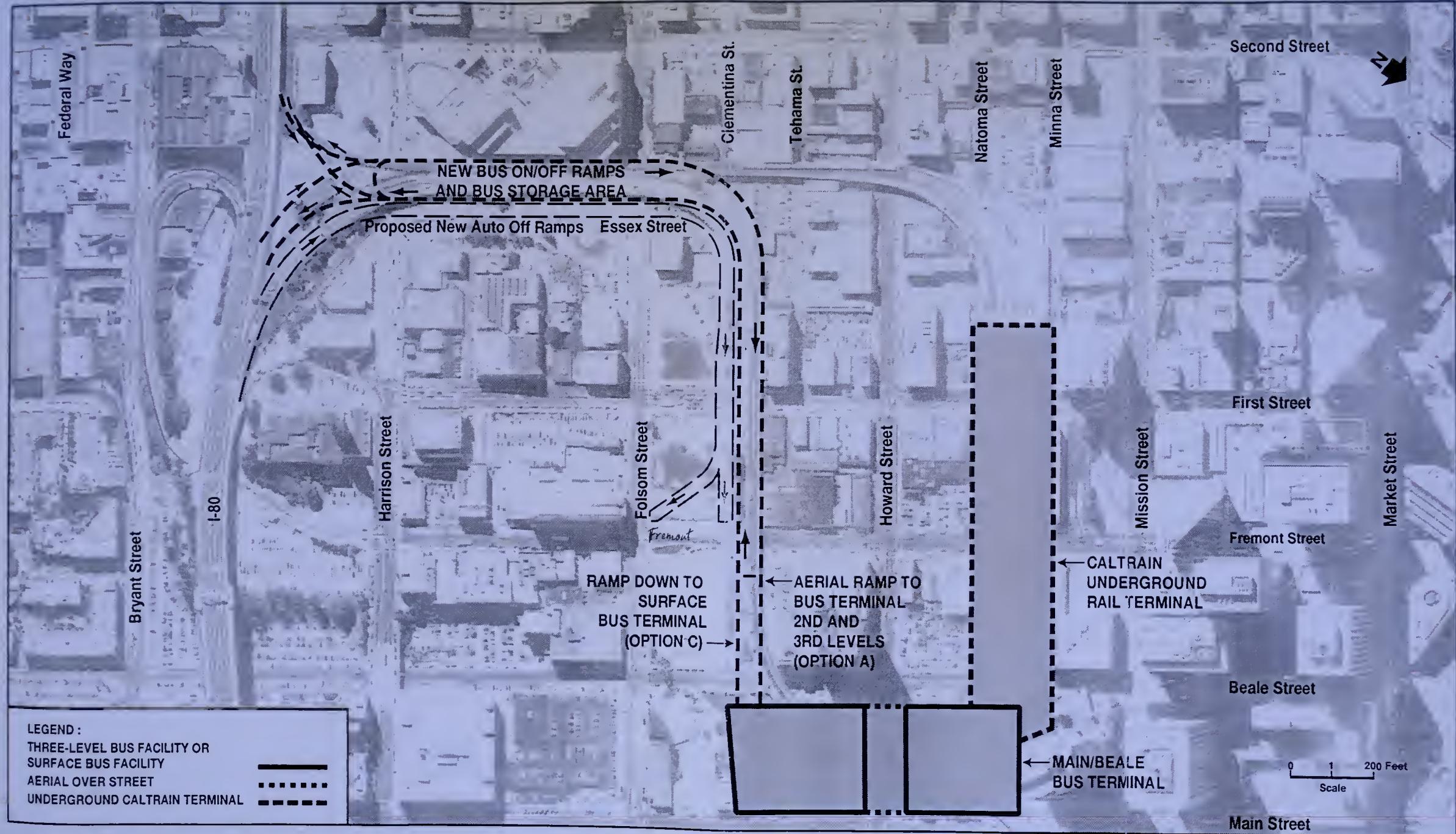
FIGURE 2-20

CALTRAIN UNDERGROUND RAIL TERMINAL  
WITH BUS TERMINAL AT MAIN/BEALE STREETS

◆ ICF KAISER/DELEUW

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**FIGURE 2-20A**  
**BUS TERMINAL AT MAIN/BEALE SITE:**  
**OPTIONS A AND C**



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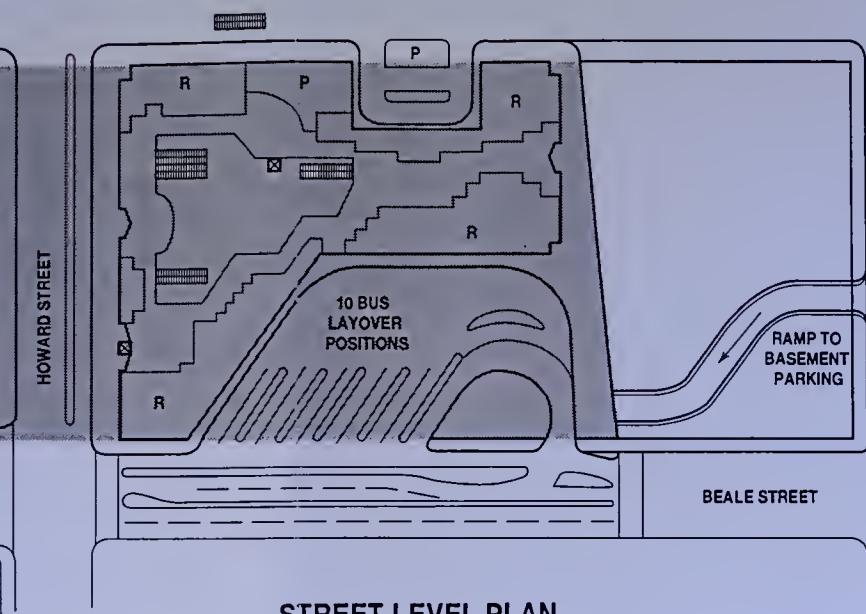
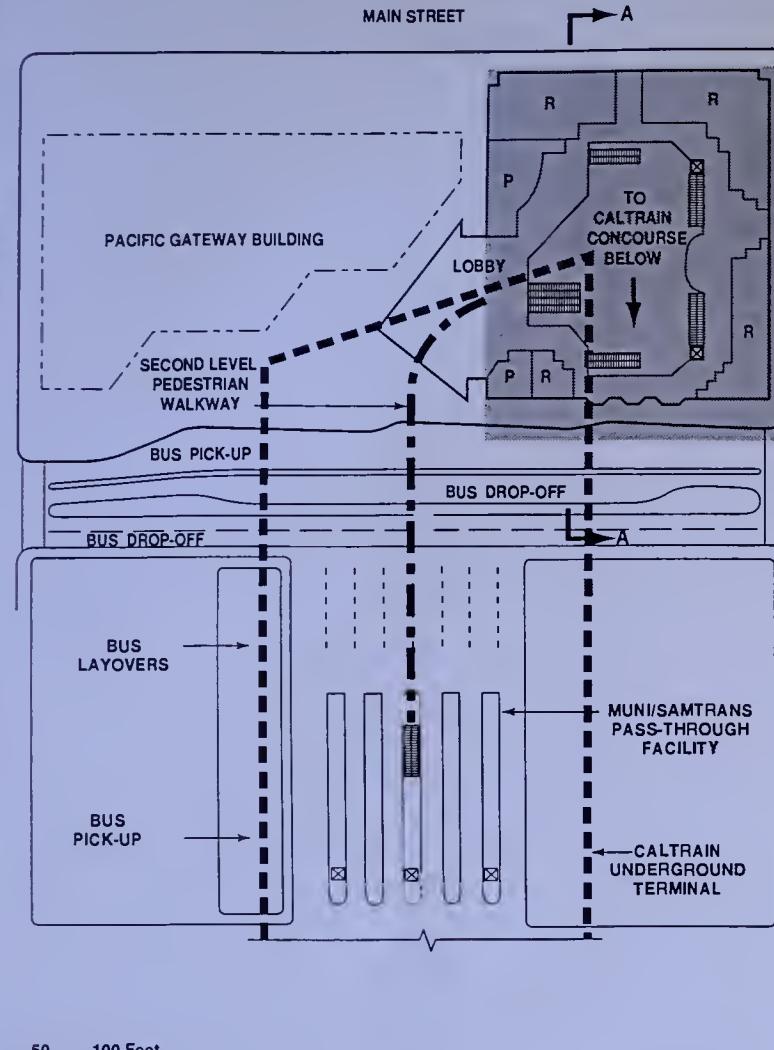
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MISSION STREET

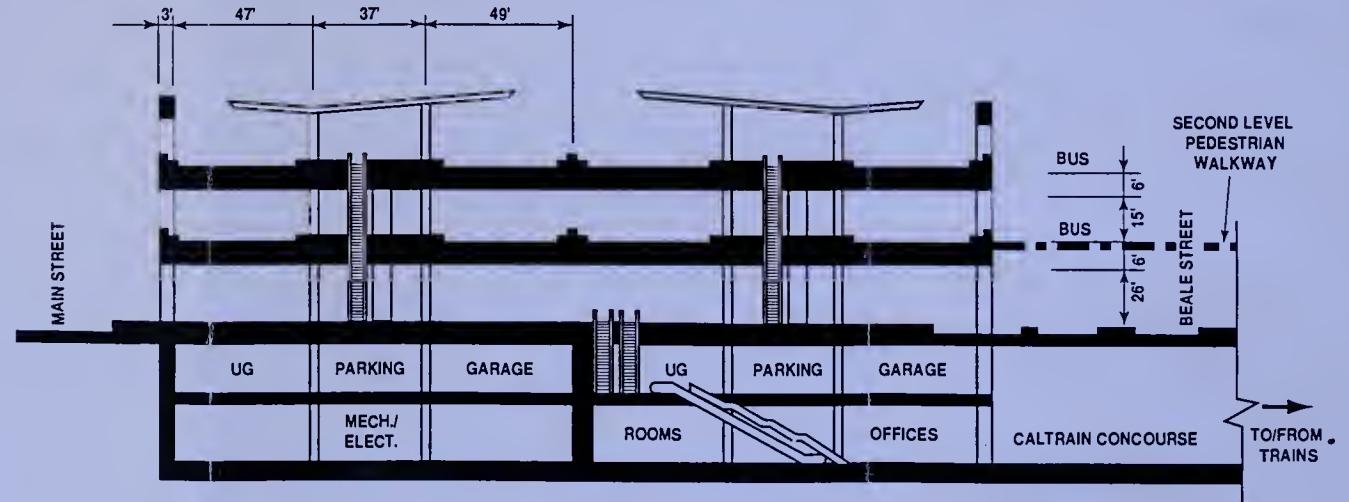


## LEGEND

- BUS TERMINAL, 2ND AND 3RD LEVELS OVER THIS AREA
- UNDERGROUND CALTRAIN TERMINAL AREA
- ELEVATORS
- ESCALATORS/STAIRS
- RETAIL AREA
- PASSENGER SERVICES

NOTE: DESIGNS ARE CONCEPTUAL - THEY ARE INTENDED TO ILLUSTRATE CONFIGURATIONS, NOT ARCHITECTURAL DESIGN.

## STREET LEVEL PLAN



## SECTION A-A

FIGURE 2-21  
MAIN/BEALE BUS TERMINAL



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use the second and third levels, which would cross over Howard Street. Fifty bus bays would be provided on two levels. A basement level parking garage could also be constructed to accommodate up to 600 vehicles.

Muni/Samtrans buses would be located across Beale Street at the Beale/Fremont Pass-through Facility, which would be connected to the Main/Beale site by a second-level pedestrian overpass as well as an underground concourse. Golden Gate Transit buses would operate on Beale. In this scenario, an interim Muni/Samtrans bus layover would be provided on Caltrans property between Beale and Fremont Streets north of Folsom during construction of the CalTrain underground terminal. Alternatively, Muni and Samtrans could have a bus layover area at the Main/Beale site (refer to Figure 2-21). Boarding platforms for Muni, Samtrans, and Golden Gate patrons would be located on the Beale Street side of the Pass-through Facility north of Howard. Since the bus layover facility would be completed prior to the demolition of the existing Transbay Terminal, an interim Muni/Samtrans facility north of Folsom would not be needed.

At the north end of the bus facility, a large entryway and concourse would provide the main pedestrian entrance to the bus terminal and identify the direct connection to the underground CalTrain station, which would be linked beneath Beale. Additionally, a 950-foot long concourse under Beale Street containing moving sidewalks would connect the bus and train terminals with the Embarcadero BART/Muni Metro Station.

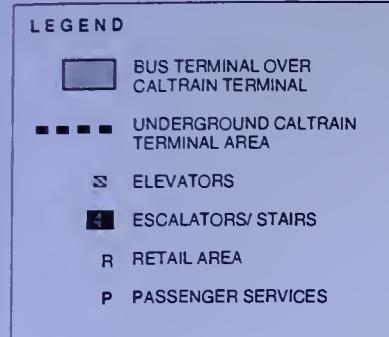
A bus terminal at the Main/Beale location would: 1) allow the Main/Beale bus terminal to be built before the existing Transbay Terminal was demolished; 2) eliminate the need for a temporary bus facility during construction of the new CalTrain terminal; and 3) permit the area above the underground CalTrain terminal to be used as open space and/or joint development.

#### ***Option B: New Bus Facility Above CalTrain Underground Station***

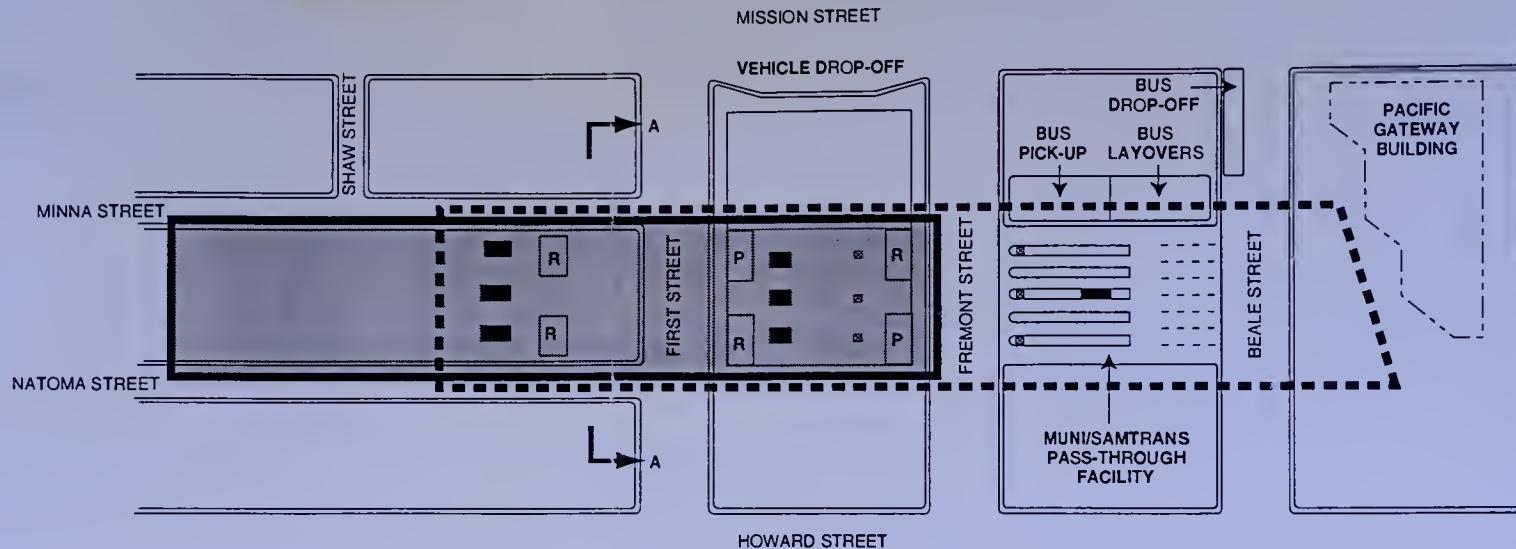
In Option B, four levels, including a mezzanine, would be built directly above the underground CalTrain station at the Transbay Terminal site. The "short" configuration bus terminal would cross over First Street. On the ground level, the main entryway, fronting on Mission Street between First and Fremont, would open into a passenger services area. Retail space (35,000 to 50,000 square feet) would be distributed to the east and west of First Street on the ground level. Between Fremont and Beale Streets, a surface Muni/Samtrans Pass-through Facility would be developed (**Figure 2-22**). Local and long distance buses would board and discharge riders on the second and third levels, which would contain a total of 45 bus bays. Golden Gate Transit would operate on First and Fremont. A mezzanine level would facilitate circulation from the ground level to the bus boarding areas above and also to the Muni/Samtrans bus terminal.

New exclusive aerial ramps would provide bus access between the Bay Bridge and the second and third levels of the facility and allow storage of approximately 65 AC Transit

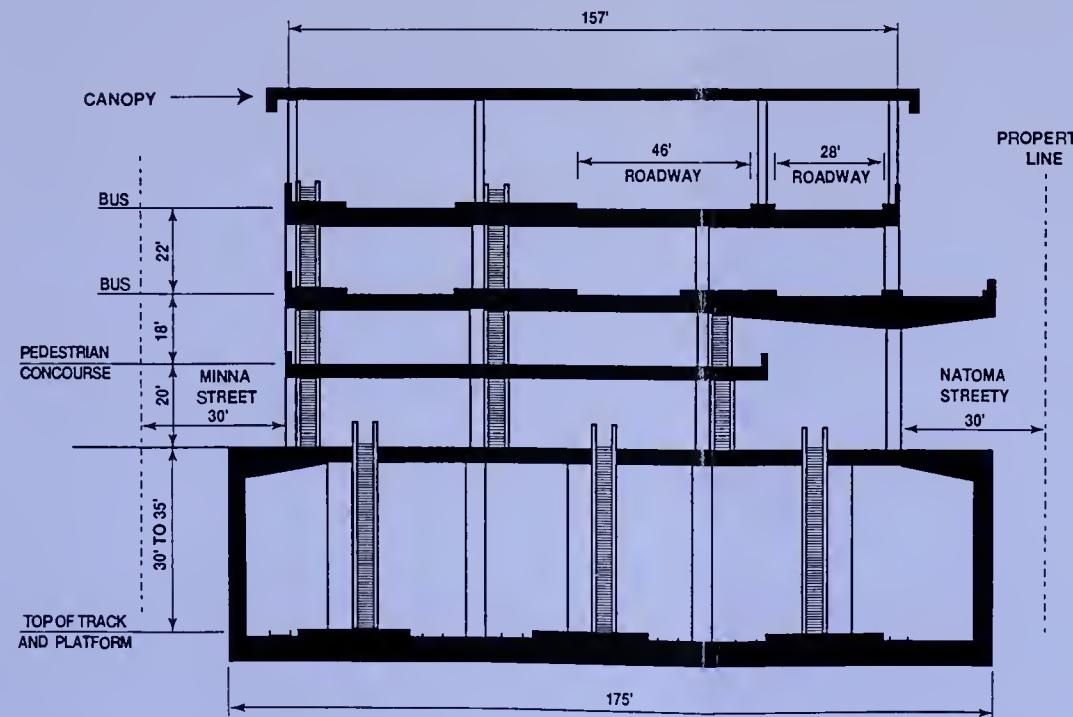




NOTE: DESIGNS ARE CONCEPTUAL - THEY ARE INTENDED TO ILLUSTRATE CONFIGURATIONS, NOT ARCHITECTURAL DESIGN.



STREET LEVEL PLAN



SECTION A-A

FIGURE 2-22  
SCHEMATIC CROSS SECTION  
BUS TERMINAL OVER UNDERGROUND  
CALTRAIN TERMINAL



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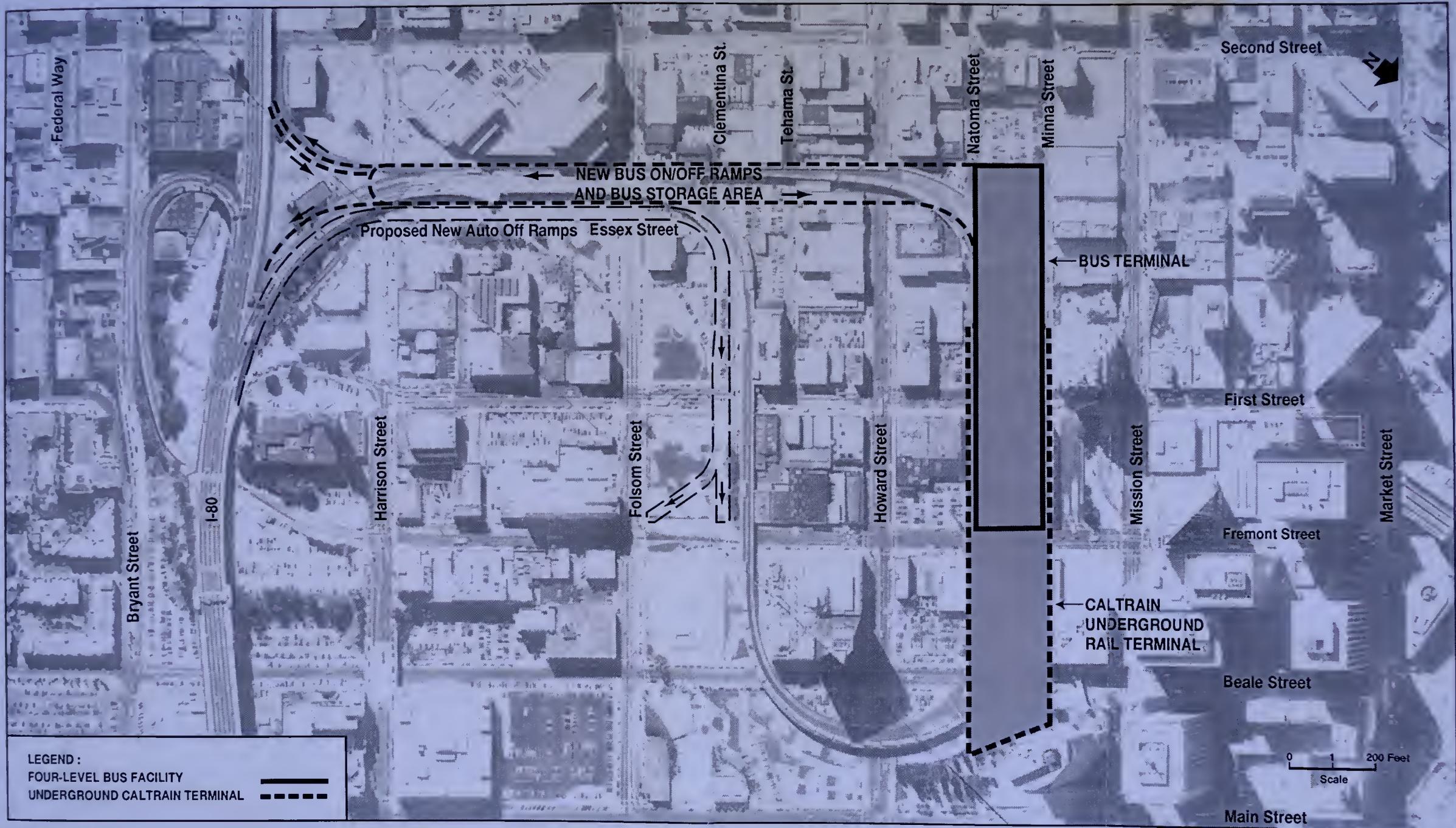


FIGURE 2-22A  
SHORT CONFIGURATION BUS TERMINAL AT  
TRANSBAY TERMINAL SITE (OPTIONS B)



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DOWNTOWN EXTENSION PROJECT



buses (**Figure 2-22A**). An underground concourse linking the terminal with BART/Muni Metro at Embarcadero Station could also be constructed.

Option B would require an interim surface bus terminal and busway (similar to the description provided in Option C) to be constructed at the Main/Beale site prior to the demolition of the existing Transbay Terminal. After construction of the underground CalTrain station and the new bus facility above, the interim terminal would be removed. Structural columns for the underground and above ground terminals could support future joint development. However, this option would preclude construction of a large public open space and underground parking garage on-site.

#### *Option C: Surface Terminal at Main/Beale*

A third option would be to develop a permanent surface bus terminal on the Main/Beale site instead of the proposed three-level bus facility, greatly reducing construction costs. In Option C, a covered street level terminal would be located north and south of Howard Street (**Figure 2-23**). North of Howard, Greyhound, Porter, and Amtrak would share 14 bus bays. South of Howard, AC Transit would have exclusive use of 21 bus bays. Muni and Samtrans would use a pass-through facility between Main and Beale as in the other options. Golden Gate Transit would operate on surface streets.

The main pedestrian entryway to the surface bus terminal would open onto Beale Street north of Howard and incorporate an area for passenger services. No retail space would be provided. An elevated walkway would link the north and south sides of the terminal with the CalTrain and Muni/Samtrans terminals across Beale. Alternatively, a concourse under Beale Street could provide the same function and connect with BART/Muni Metro at Embarcadero Station as well.

Bus access to the site would be via exclusive aerial ramps, built in the same right-of-way as the existing inbound bus ramps parallel and north of Folsom Street. East of Fremont Street, the aerial bus ramp would descend to grade and cross Beale Street at a new signalized intersection located between Folsom and Howard Streets. Storage of approximately 80 AC Transit buses would be provided in a surface lot at a remote site to be determined.

A summary of bus terminal mitigation options is provided in Table 2-3.

#### **2.4.4 Locomotive Propulsion Options**

Three propulsion options are being considered for the DTX Project: 1) dual mode/electric trailer units; 2) dual mode/new locomotives; and 3) full system electrification (**Figure 2-24**).



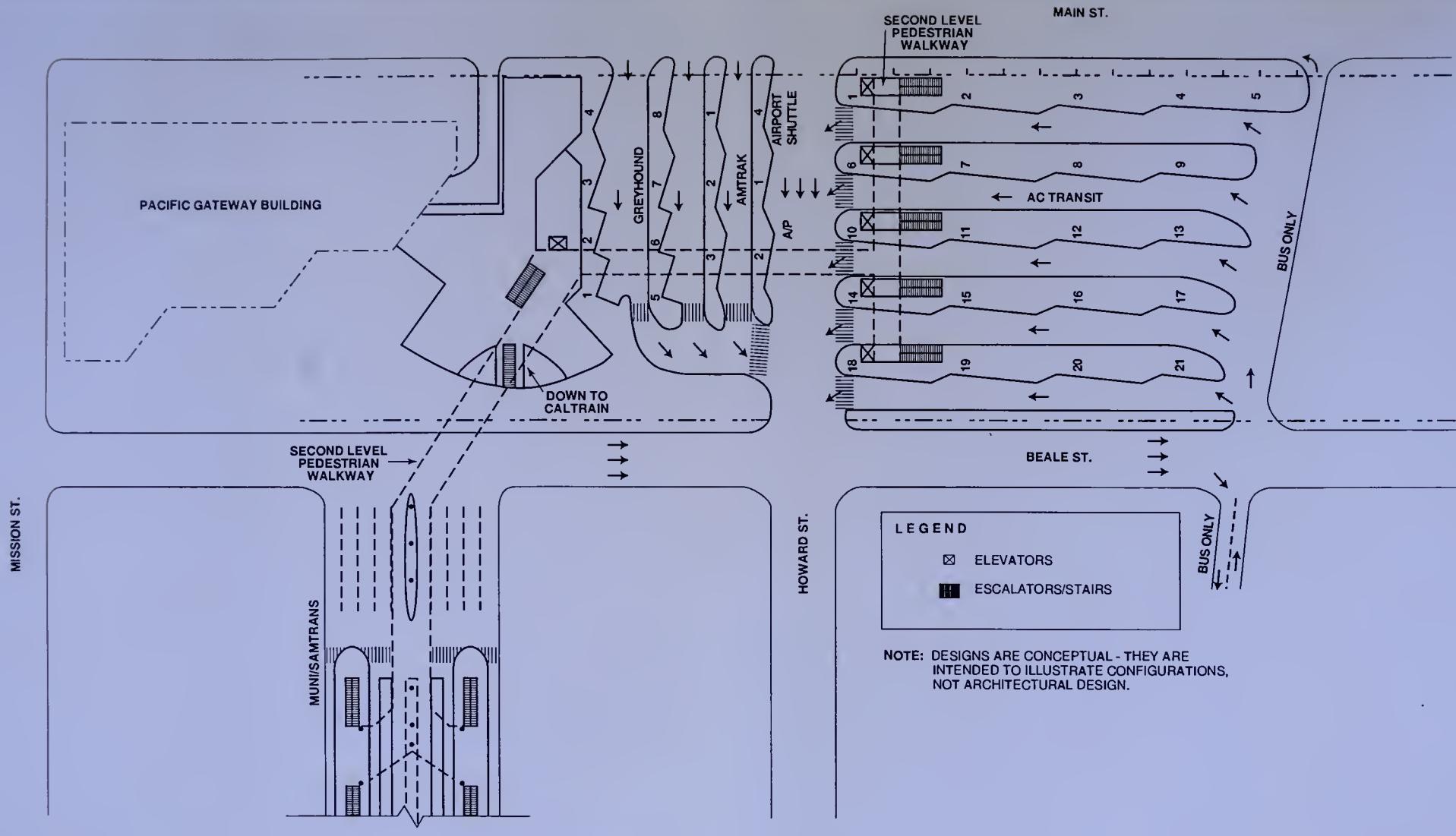


FIGURE 2-23  
SURFACE BUS TERMINAL OPTION C  
AT MAIN/BEALE



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**TABLE 2-3: CALTRAIN/BUS TERMINAL OPTIONS**

	OPTION A	OPTION B	OPTION C
Bus Terminal Location*	Main/Beale North	Transbay Terminal Site (Short Configuration)	Main/Beale North
Bus Facility	3-Level Terminal	4-Level Terminal	Surface Terminal
Muni/Samtrans Bus Terminal	Beale/Fremont Pass-Through Layover Area	Beale/Fremont Pass-Through Layover Area	Beale/Fremont Pass-Through Layover Area
Bay Bridge Access	New Aerial Bus Ramp Adjacent to Fremont Auto Ramp	New Aerial Bus Ramp Along Essex Corridor	Aerial Bus Ramp Across Fremont as in Option A, but without a Bus Storage Area
AC Transit Bus Storage	Essex and Fremont Bus Ramps - ~80 Spaces	Essex Bus Ramp - ~65 Spaces	Remote Surface Lot Location - ~80 spaces
Bus Spaces in Terminal	AC ..... 30 Greyhound ..... 9 Other ..... 11 Total ..... 50	AC ..... 30 Greyhound ..... 9 Other ..... 6-7 Total ..... 45	AC ..... 21 Greyhound ..... 8 Other ..... 6 Total ..... 35
Capital Cost**	\$155 million±	\$165 million±***	\$50 million±

\* CalTrain Station is underground at Transbay Terminal site for all options.

\*\* Base cost plus possible additives

\*\*\* Including interim 35-bus bay surface facility at Main/Beale site.

### **Dual Mode/Electric Trailer Units**

In this propulsion option, existing diesel locomotives would power CalTrain from Gilroy to approximately Mariposa Street in Mission Bay. To prevent the release of diesel exhaust pollutants in the underground terminal, an electric power converter unit, coupled to the existing diesel locomotives, would provide power for the underground operation into the downtown terminal. Three additional diesel locomotives and 23 electric power trailer units would be required.

The dual mode/electric trailer unit option has two major advantages. First, this option does not require the change-out replacement of the existing diesel locomotive fleet, which would cost about \$100 million to replace with new dual-mode locomotives. Second, this option can utilize a 25,000 Volt AC overhead catenary power supply system, which is the standard voltage used on mainline electric railroads around the world. Therefore, unlike the dual mode/new locomotives option presented below, it permits a staged approach to full system electrification of the entire CalTrain system, which is the JPB's long-range goal.





Diesel Propulsion with  
Electric Trailer Unit



Electric Propulsion



Dual-Mode (Diesel/Electric)  
Propulsion



CALTRAIN SAN FRANCISCO  
DOWNTOWN EXTENSION PROJECT

PENINSULA CORRIDOR JOINT POWERS BOARD

FIGURE 2-24  
LOCOMOTIVE PROPULSION OPTIONS



### **Dual Mode/New Locomotives**

As a second dual mode option, new locomotives that contain both diesel and electric power capability, would replace the existing diesel fleet. The diesel engine would provide power for surface operation and electric power would be used in the underground downtown extension. The locomotives would draw electricity from an overhead catenary system. The only existing "off-the-shelf" dual mode locomotives available utilize low voltage (600-750 Volts) DC power and are not technically compatible with standard mainline railroad electric locomotives which utilize high voltage (25,000 Volts) AC power. It would require a major research and development effort to design and build new dual-mode locomotives capable of operating on 25,000 Volt AC power. For this reason, then, it was assumed that the CalTrain downtown extension would have to be initially powered utilizing a 750-Volt DC overhead power distribution system and substations to be compatible with available off-the-shelf dual-mode locomotives. The overhead power distribution system would be designed and built so that it could be easily upgraded to 25,000 Volt AC power for full system electrification in the future. Only the power substations would have to be replaced.

The major disadvantage to this system is that it precludes full system electrification without replacing all of the dual-mode locomotives with new electric locomotive.

For this propulsion option, the entire existing diesel locomotive fleet would be replaced by 23 dual-mode locomotives.

### **Full System Electrification**

System electrification would require the entire CalTrain alignment from Gilroy to the downtown terminal to be electrified, including the planned new maintenance and storage facility in San Jose or Santa Clara and the proposed train storage yard in Mission Bay. The electrification would include the following components:

- 25 KV AC traction power system, including five substations and three tie breaker stations;
- Overhead wire system using a side pole arrangement spaced approximately 200 feet apart to support the overhead wire;
- State-of-the-art communications system; and
- Rehabilitated railroad signaling system.

Full system electrification offers: 1) a pollution-free system; 2) reduced noise levels produced by locomotives operating on the surface or underground; and 3) superior acceleration characteristics of electric locomotives. However, the cost of system electrification is significantly higher than the purchase of electric trailer units for the existing diesel fleet.



The entire existing diesel locomotive fleet would be replaced with 23 electric locomotives.

#### **2.4.5 San Francisco CalTrain Storage Yard**

A six-track CalTrain downtown terminal could not accommodate trains that have prolonged layover periods in San Francisco. Consequently, a new train storage area would be developed under and parallel to the I-280 freeway viaduct in Mission Bay. The proposed storage area in Mission Bay would have eight tracks extending from Hubbell to 16th Street. Lead tracks from the north and south would link the storage area with the CalTrain mainline (**Figure 2-25**). The location of the storage area would require shifting the planned Muni Metro extension alignment to the east within 150 feet of Owens Street. The deadhead time from the downtown terminal to this storage area would be approximately 13 minutes.

### **2.5 RIDERSHIP PROJECTIONS SUMMARY**

Preliminary 2010 ridership projections were developed for the No Build and Transbay Terminal Alternatives. The projections were based on the existing output from the MTC Regional Transportation Plan model forecasts that were prepared in 1994. To make the regional model more relevant for the DTX Project, manual modifications and procedures were made using the San Mateo Countywide model to account for: 1) changes in configuration of connections between CalTrain, BART, and the light rail system planned for San Francisco International Airport; 2) parking capacity constraints at Peninsula CalTrain stations; 3) updated 1994 demographic information; and 4) sensitivity to increased mid-day CalTrain service.

The projections reflect two level-of-service scenarios, 60 weekday trains and 86 weekday trains. The increase in weekday trains is due to nearly doubling midday service and the addition of one peak period express train. In addition, the forecasts assumed a 10% reduction in CalTrain travel times between the boarding station and an ultimate destination in San Francisco's Financial District north of Market Street due to track and signal upgrades on the Peninsula and system electrification. Proposed land use changes in San Francisco's Mission Bay Plan and the potential use of land made available by the removal of the Terminal Separator ramps in Downtown San Francisco were not factored into the model assumptions.

Table 2-4 presents the travel demand forecast results for the 86-weekday train scenario for the No Build and Transbay Terminal Site Alternatives. The Build Alternative could be expected to generate 44,000 daily riders if parking capacity constraints were alleviated at CalTrain stations. This figure represents an increase of more than 10,500 daily riders over the No Build scenario. With adjustments to the existing station parking supply to meet the unconstrained demand (during the morning peak period) and other aforementioned adjustments, the Build Alternative would attract approximately 5,000 new transit riders.



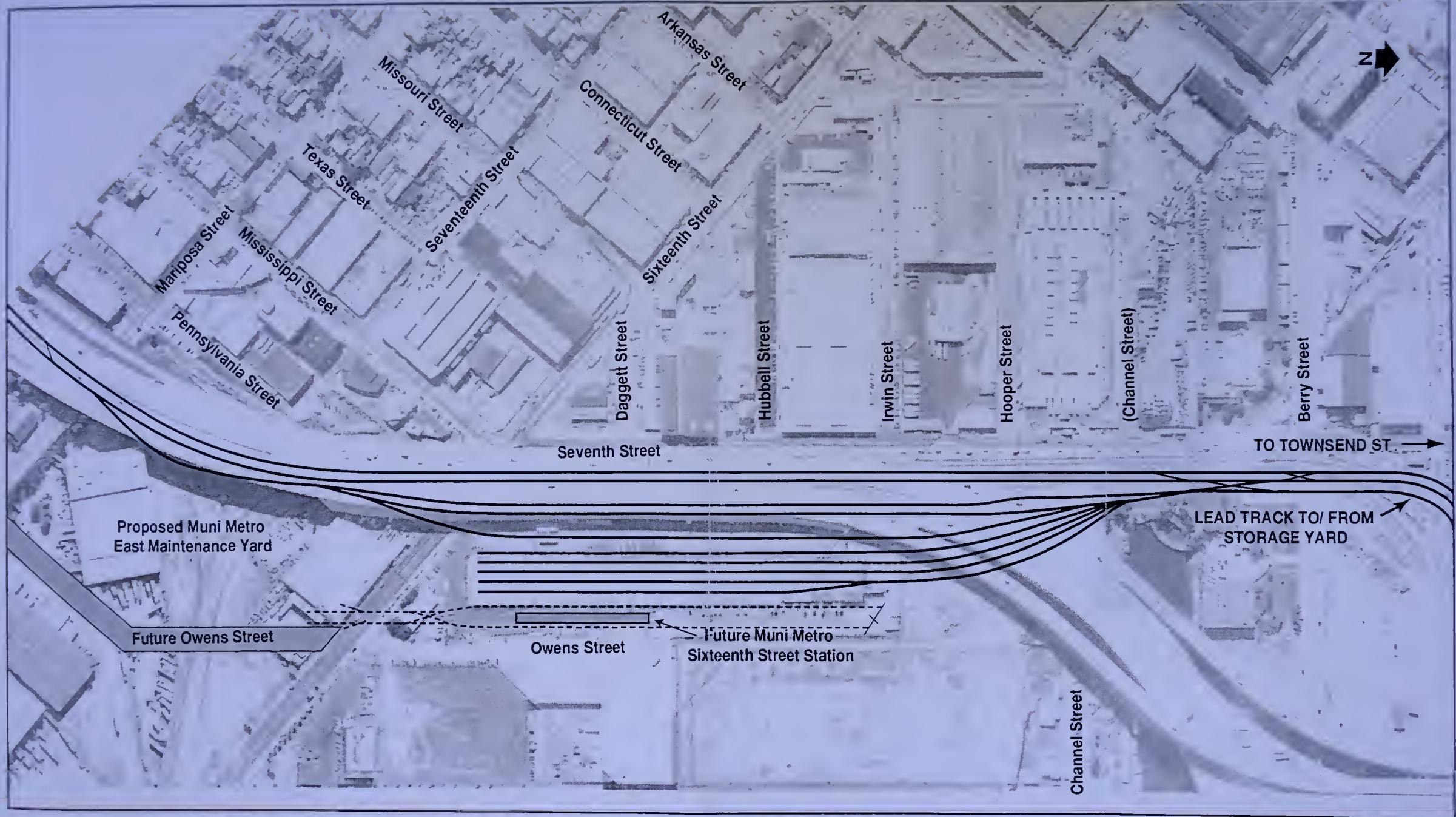


FIGURE 2-25  
16TH STREET/I-280 (MISSION BAY)  
CALTRAIN STORAGE YARD LOCATION AND CONFIGURATION



CALTRAIN SAN FRANCISCO  
DOWNTOWN EXTENSION PROJECT

PENINSULA CORRIDOR JOINT POWERS BOARD

• ICF KUSER/DELEAU

JRS-068 50 250 MSL



**TABLE 2-4: SUMMARY OF TRAVEL DEMAND FORECAST RESULTS**

Measure	CalTrain Downtown Extension Project	
	No Build	Transbay Terminal
Daily System Entries	33,350	44,000
Annual Ridership	9.3 million	12.2 million
Daily San Francisco Terminal Entries and Exits	9,000	17,700
Daily System Departures by Walking	14,917	25,305
Daily System Departures by Transferring to Transit	18,026	16,577
Daily Auto-Access Demand	10,163	11,714

### **2.5.1 Fleet Requirements**

To meet this demand, CalTrain would need 115 gallery-type passenger cars, including 14% spares. This number is 25 more cars than is currently in the fleet or expected to arrive after the current new car order is complete.

### **2.5.2 Mitigation for Parking Capacity Constraints**

Travel demand forecasts for operating 86 weekday trains to the Transbay Terminal site indicate that the supply of existing park-and-ride spaces at San Francisco and Peninsula stations could not accommodate the projected demand. As a result, implementing the Build Alternative would require an additional 2,548 parking spaces to serve commuter demand at the stations projected to have parking deficits as indicated with shading in Table 2-5. Solutions to the parking deficits will be evaluated on a station-by-station basis in the environmental analysis.

## **2.6 CAPITAL COST SUMMARY**

Table 2-6 presents a preliminary capital cost summary for the Transbay Terminal Site Alternative. Capital costs are categorized by terminal station, portal and tunnel alignment, utilities, systems, fleet, station park-and-ride lot expansion, and right-of-way costs and compared for an alignment with a short-radius mined tunnel and long-radius mined tunnel. The total capital cost for the Build Alternative is estimated to be approximately \$700 million in 1995 dollars. Costs for the longer subway through Mission Bay and for full-system electrification or dual-mode locomotives would be in addition to this estimate.

## **2.7 OPERATING AND MAINTENANCE (O&M) COST SUMMARY**

Operating and maintenance costs were compared for the No Build and Transbay Terminal Site Alternatives as shown in Table 2-7. The table identifies O&M costs for 60- and 86-train scenarios for diesel and electric operations. In addition, costs are



**TABLE 2-5: STATION PARKING BALANCE:  
EXISTING AND 2010 BUILD 6B ALTERNATIVE**

Station	Parking Demand		Parking Supply**	Parking Balance	
	Existing '95*	2010 Build	Existing	Existing	2010 Build
San Francisco	0	31	NA	0	-31
22nd Street	15	82	24	0	-58
Paul Ave.	0	0	NA	0	0
Bayshore	14	19	41	27	22
S. San Francisco	49	103	51	0	-52
San Bruno	147	229	187	49	-42
Millbrae	171	546	200	16	-346
Broadway	111	163	146	35	-17
Burlingame	51	271	55	0	-216
San Mateo	201	332	205	0	-127
Hayward Park	0	185	NA	0	-185
Bay Meadows	0	0	NA	0	0
Hillsdale	170	726	170	0	-556
Belmont	146	458	203	57	-255
San Carlos	202	426	235	33	-191
Sequoia-Redwood City	625	625	703	78	78
Atherton	237	237	286	49	19
Menlo Park	147	260	147	0	-113
Palo Alto	272	422	347	75	-75
California Ave.	155	245	181	26	-64
San Antonio Road	0	45	NA	0	-45
Mountain View	244	300	295	1	-55
Sunnyvale	149	395	191	42	-204
Lawrence	113	422	141	28	19
Santa Clara	171	355	295	124	-60
College Park	0	0	NA	0	0
San Jose/Diridon	328	735	645	317	-90
Tamien	80	158	400	320	242
Capitol	12	12	317	305	305
Blossom Hill	54	54	407	353	353
Morgan Hill	123	123	524	401	401
San Martin	56	56	120	64	64
Gilroy	165	165	233	68	68
<b>Subtotal (SF-SJ)</b>	<b>3722</b>	<b>7312</b>	<b>4698</b>	<b>976</b>	<b>-2614</b>
<b>Total</b>	<b>4212</b>	<b>7880</b>	<b>6699</b>	<b>2487</b>	<b>-1181</b>

Note: \* The existing demand was derived from the field surveys on parking lots.

\*\* Parking supply includes JPB lots and city lots dedicated to CalTrain users.

Shading indicates projected parking deficit at the station indicated.

Handicapped parking and motorcycle parking are excluded.

NA = Not Available or not official CalTrain parking.



**TABLE 2-6: CALTRAIN DOWNTOWN EXTENSION PROJECT  
CAPITAL COST ESTIMATES<sup>(1),(2),(3)</sup>**

Transbay Terminal Site Alternative Underground Station		
COST ELEMENTS	Short-Radius Mined Tunnel Alignment	Long-Radius Mined Tunnel Alignment
CalTrain Terminal (6 tracks underground)	\$ 82,382	\$ 82,382
CalTrain Extension (underground)	138,645	146,890
Sitework & Utilities	29,585	26,342
CalTrain System Elements	22,173	22,066
CalTrain Equipment Needs	47,875	47,875
Park-and-Ride Lot Expansion	TBD	TBD
Right-of-Way & Easements	9,242	7,331
<b>Subtotal:</b>	<b>\$329,902</b>	<b>\$332,886</b>
Design, CM, & Owner Costs	75,852	82,160
Contingency Allowance	90,611	91,959
Project Reserve (8%)	37,459	38,310
<b>Total<sup>(2)(3)</sup> for CalTrain Extension and Terminal</b>	<b>\$533,824</b>	<b>\$545,315</b>
<b>Transbay Bus Terminal &amp; Ramps Replacement</b>	<b>\$150,000</b>	<b>\$150,000</b>
<b>GRAND TOTAL</b>	<b>\$683,824</b>	<b>\$695,315</b>

<sup>(1)</sup>In thousands of 1995 dollars <sup>(2)</sup>Full system electrification would cost about \$210,000,000 more <sup>(3)</sup> The long tunnel option in Mission Bay would cost about \$100 million more.

broken down into two operating segments: 1) the Peninsula Commute Service; and 2) the extension to a downtown terminal. For the 86-train scenario, the Build Alternative is estimated to cost \$8.6 million more to operate and maintain than the No Build Alternative. In addition, electric locomotive operation is estimated to cost approximately \$1 million more per year to operate than the current diesel locomotive operation.



**TABLE 2-7: CALTRAIN DOWNTOWN EXTENSION PROJECT  
SUMMARY OF O&M ESTIMATES**

STUDY ALTERNATIVE	PCS O&M COST ESTIMATES	SUBWAY STATION O&M COSTS	TOTAL O&M COSTS	INCREMENTAL COSTS	PCS COST per TRAIN-HOUR
<b>NO-BUILD ALTERNATIVE</b>					
60 trains	\$49,399,549	--	\$49,399,549	--	\$1,777
86 trains	\$61,276,160	--	\$61,276,160	--	\$1,572
<b>TRANSBAY TERMINAL</b>					
1. Diesel Operations					
60 trains	\$55,351,964	\$1,340,000	\$56,691,964	\$7,292,415	\$1,963
86 trains	\$68,528,999	\$1,340,000	\$69,868,999	\$8,592,839	\$1,740
2. Electric Operations					
60 trains	\$56,501,985	\$1,340,000	\$57,841,985	8,442,436	\$2,004
86 trains	\$69,560,281	\$1,340,000	\$70,900,281	\$9,624,121	\$1,766

NOTES:

- (1) Costs based on operating statistics defined by David Minister, Aug-30-95.
- (2) Cost estimated for each alternative in 1995 dollars.
- (3) Costs for each alternative based on 60- and 86-train scenarios.
- (4) Incremental costs relative to No-Build alternative.
- (5) Cost Summary tables for each alternative are provided in the Appendix.













